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THE METAL INDUSTRY

WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER
ELECTRO-PLATERS REVIEW

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The Manufacture of Name-Plates

A Description of the Processes from Designing to Packing

Written for The Metal Industry by FRANK V. FAULHABER

To make a high-grade name plate two things are essential, namely, reliable materials used in the manufacturing of that product and dependable labor. Thus, it is of importance when desiring to produce a specific name-plate, say, of brass, that the metal is of the best obtainable. In manufacturing different name-plates metals of different gauges are used, utilizing, of course, that gauge metal that is best adaptable for certain name-plates. A name-plate of 14 gauge brass would not harmonize if intended for an article of fine make. Such a name-plate would, on the other hand, prove suitable for heavy machines, such as tractors.

Work can often be produced to advantage by combining different orders of name-plates on the same negative, providing, of course, the name-plates desired are of the same gauge metal, as called for on the orders. Many times, by arranging the prints skilfully, three different kinds can be assembled, then making the negative.

THE DRAWING

Making the drawing of the inscription, sometimes including a trade-mark or picture, is about the first operation in the manufacturing of name-plates. However, even until this is finally decided upon many interruptions attend. Ofter there is involved the submission of various proofs or prints until the buyer is finally satisfied to give the order to proceed. The drawing must be an exact representation of the name-plates to be produced, with the exception of the size which is two or two and a half times as large as the finished plate. The reason for this is that minor details in a name-plate would not develop in the photographic negative if the drawing were of the same size. Thus it requires a larger drawing in order to bring out every small detail distinctly.

THE NEGATIVE

After the drawing is made from a sketch or blue-print the photographer makes a negative therefrom reduced to the identical size as desired in the finished name-plate. Following this operation, many prints are made on contrast paper from this negative. These prints, after they have been thoroughly dried, are then cut to desirable dimensions, of the same size as the finished name-plates. They are then pasted on a card-board, neatly arranged in even rows, or as otherwise decided upon. Ordinarily, when but one size name-plate is processed, they are arranged in multiple series. This, incidentally, permits easy separation of the plates when cutting. Rather than have these prints too large when making the arrangement have them smaller.

After the pattern has been produced the artist goes over it, making slight re-touches and indicating the cutting lines and the holes to be pierced in the finished plate. The re-touching is done with black ink, while the other detail is performed with white, using camel's hair brushes. Now the pattern is ready for the production of a wet plate photographic negative, same size. After this has been developed and washed in clear water in a basin, letting the water run over the negative for at least a half hour, it is withdrawn, subsequently to be dried by setting it on a rack.

Here sometimes touching up will be necessary with opaque, otherwise stipples and other marks will show in the finished plates. Everything else being satisfactory a print is now made on zinc, the latter being grained beforehand. These can be procured ready for use from any lithographer. The zinc which is to furnish the print is dipped for a few seconds in a solution of one gallon of water and two ounces of muriatic acid. Then the zinc is washed in water. After it is clean and while yet moist a sensitizing solution is poured over it, the latter made by beating an egg, or using albumen of an equal amount, mixed with twelve ounces of pure water in which has been dissolved sixteen grains of bichromate of soda. This solution is compounded and retained in a dark place, for light weakens it.

The solution must then be permitted to run off one side of the zinc which is then allowed to dry slowly and uniformly, using any heating agent; however, as much as possible away from light. The next operation is to adjust it in the printing frame, in such a manner that the sensitized side of the zinc rests against the coated side of the negative. It is subsequently exposed to the sun for a few minutes, then withdrawn and rolled with lithographic ink, covering the entire surface of the plate. The plate is then washed in clear running water and lightly rubbed with some absorbent cotton until the print finally comes up.

ETCHING

Following this developing operation is the etching process. This solution is produced by the mixing of one ounce of chromic acid, a similar amount of phosphoric acid, and sixteen ounches of gum water. The latter ingredient is made by dissolving gum arabic in water, which can be procured at any druggist as desired. The wiser policy is to make this etching solution to satisfy needs.

for it will not keep for a long time; in any event should be stored in a dark place.

A light sponge is necessary in etching the zinc plate. After dipping in the solution the entire plate is covered. It is now washed off quickly so that it will resist etching through the ink. The sponge is then saturated with the gum water, rubbed over the zinc plate, then dried by fanning. At this point the etching is so slight as to be hardly discernible. When the gum has dried on the zinc, it is removed with turpentine, then dried again and rubbed with a thin asphaltum paint, subsequently to be dried by fanning. It is now washed with water, using a sponge, and then mopped with a pad made of absorbent cotton. All these operations require extreme care.

PREPARATION FOR PRINTING

To be prepared for printing the metal sheets to be used must be cleaned and cut to the desired lengths. The usual run of brass is received in six-foot lengths, ten or twelve inches wide. Having decided upon the dimensions of the sheets to be used by the printer, a special instruction slip is made out, with the order number, or more, if the occasion calls for it, showing the number of sheets to be used and the number of name-plates on each sheet, thus obviating the possibility of making too many or not enough plates. On the instruction sheet the gauge metal is shown and all other advisable data.

The long sheets of brass are then selected by the buffer, enough to furnish the printer the required amount of ready sheets. The long sheets, if intended for ordinary brass name-plates, are then buffed until they attain a high lustre. Sometimes the work, according to the conditions, is done on a polishing machine. After the sheets have undergone this operation they are ready to cut into sheets of the required size. This is done on a shearing machine, the gauge being set thereon so that sheets will be of equal size. If this is not done, the sheets will sometimes be too large, causing a waste of metal, or sometimes too small, the latter case at times developing the fact that on these sheets some parts of the name-plates at one end are missing for want of adequate metal. This, too, is waste.

After the long sheets are cut into those of the desired size the latter are ready to be washed in benzine to remove the grease, then dried in sawdust. After this comes the final polishing with pumice powder until the sheets are free from all particles of dust and dirt, the side which is to be printed having a bright surface.

PRINTING

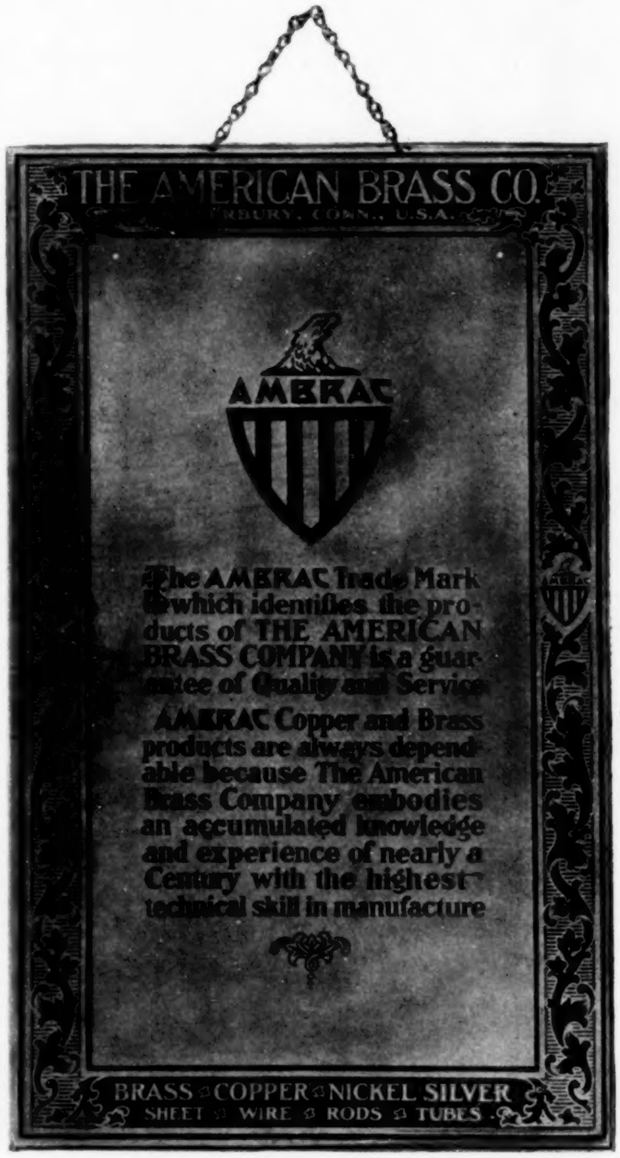
The sheets are now ready for printing on an offset press. At this point is entailed a discussion of the printer's art. However, it is not necessary to expand upon this phase of the work. Let us assume the printing is to be performed on an offset power press. The printer now makes the zinc plate ready. Here, too, great care is necessary. It is highly desirable that this plate is set securely and evenly, to insure uniform printing of the sheets. After everything is prepared the sheets are fed into the press, accurately to make for proper work, while they are received by another workman as they leave the fly. Handling them with care the latter places the sheets on a rack, face upward, so that no two sheets come in contact with each other. A finger mark on the printed surface of the sheet usually means that a part is spoiled.

ASPHALTUM COAT AND BAKE

Subsequently these sheets are powdered with asphaltum, the greater part of this dust then being removed with a camels' hair brush about six inches wide. Immediately thereafter the sheets are baked in a gas oven until the print attains a black hue. After the sheets are withdrawn from the oven, the backs, or unprinted surfaces, are covered entirely with asphaltum paint, this operation counteracting etching action on these sides.

ETCHING

The coated sheets when dry are ready for the etching process. For the etching of aluminum, brass and copper sheets, there is used a saturated solution of perchloride of



AN EXCELLENT EXAMPLE OF ETCHING ON BRASS

iron. The etching of aluminum requires a little more time than the other two metals. Before submersion, the sheets are carefully adjusted onto a specially constructed rack, the latter then being placed in a wooden tank, especially built for this purpose. By means of an electrical apparatus the sheets can then be oscillated as necessary. Thus kept in motion in the etching solution, the work is accomplished more quickly and better, the washing action of the reciprocating apparatus insuring clean and uniform plates.

After the desired depth has been made each sheet is withdrawn, one at a time, and immediately submerged in another bath of perchloride of iron, the latter diluted with about one-third water. The sheets next are lightly brushed with ordinary table salt while undergoing this solutioning, which removes the oxide developed by the

etching acid. For this work a soft bristle brush is used which has been permitted to soak in water beforehand.

Following this operation the sheets are rinsed in fresh water so that all residue salt and acid will be obliterated. The sheets are then ready for oxidizing. This solution is prepared with one pound of carbonate of copper, one gallon of ammonia, and about two gallons of clear water. This should be prepared at least a day before using. The plates or sheets can then be adjusted in the tank as before, to be oscillated in this solution, usually about four or five minutes.

After being oxidized as required, the sheets are withdrawn, then are washed thoroughly and permitted to dry. Later the lithographic ink is removed, usually by scrubbing the plates with benzine, then drying them with sawdust, the latter in a box in which the sheets are thoroughly gone over. By means of a fine feather duster all remaining particles of dust are then removed.

LACQUERING

The plates now are ready for the lacquering stage. For different finishes different lacquers are required. As the case warrants, the lacquer is mixed with a thinner. This is then applied to the sheets, usually with an air brush. In extreme cases, when unusually high glossy surfaces are desired, the lacquering is done twice. Following the lacquering operation, the racks are placed in the baking oven, about six sheets on each rack, and permitted to remain until thoroughly dry.

TRIMMING AND FINISHING

Later the sheets are withdrawn, exercising care that the printed surfaces are not scratched, and then trimmed on a shearing machine, and divided into strips as necessary. Holes of the desired diameter are then punched in, usually by means of a foot press. All the time, while these are minor operations compared to other, care in handling the sheets is essential. The lacquered surface is easily scratched.

After the holes have been pierced the name-plates are separated, at the shearing machine, sometimes the work being facilitated by adjusting a gauge. When rounded corners are desired, this involves another operation, requiring the use of a special die. This work, also, is performed on a foot press.

In manufacturing round or oval name-plates, special dies are necessary, the material then being blanked out at a power press. If the metal is of a very light gauge and small irregular plates desired, the work sometimes can be performed at an ordinary foot press. There are many deciding factors, depending upon the circumstances.

After the name-plates have been separated and have been rounded when required, they are ready for packing. This brings to mind some experiences recently witnessed.

PACKING

Goods that are send out too quickly often come back even more quickly. When hasty shipments are the object, there is a tendency to do slipshod work. Then, too, work which is otherwise satisfactory reaches the consignee in a poor condition because of improper packing. Some name-plate manufacturers may contend that the art of packing is only an incidental. Such executives fail to realize that the product, if improperly handled and packed the same way, are the cause for many rejections.

It has been within the writer's experience to observe many such rejections. Name-plates, especially those of a high-grade finish, such as silver-plated work, whether glossy or subdued, require extra care in packing and shipping. Some name-plate manufacturers use tissue to make for neat packages and to conserve space. Such a procedure is satisfactory provided the goods are wrapped in stronger paper before shipping. The tissue paper of itself will not suffice. However, some will persist in simply using tissue for their high-grade goods, subsequently expressing wonder why they are returned containing scratches.

Quite recently it was noticed in one factory that a consignment of goods was refused because the flimsy tissue adhered to the print on the name-plates. The reason the tissue paper had adhered to the name-plates was that the lacquer had not yet dried before wrapping. Another contributing factor was the ink or paint which of itself was not thoroughly dry. Often the reason for this is the damp weather.

In the case of the different shades of silver-plated name-plates, dials and similar material, it is advisable to pack these more carefully. In wrapping, the face of one name-plate or dial should not come in contact with the face of another. The neglect of this admonition is just the reason why so many plates and dials are readily scratched.

Some foremen require that a separate piece of paper be inserted between each pair of name-plates or dials. A wise procedure is to reverse the material, wrapping two in this way, folding the paper, then wrapping two more, always reversed, which should permit ten plates or dials of ordinary size to one wrapper. Where extra care must be exercised, an additional piece of tissue is placed between the finished surfaces of the articles and the wrappers, to eliminate all possible friction.

SPECIAL PRECAUTIONS

In high-grade work it is advisable to withdraw each strip separately from back of the shearing machine. In some factories provisions are made so that the falling surface in back of the shearing machine is almost on a level with the working surface, thus averting possible scratches which often are made when the plates or strips drop too far onto each other.

In piercing holes much can be said as to the proper care in handling the material. Often, when locating the holes, scratches are easily made, especially in the regions of the holes, if the work is laboriously done by an inexperienced operator. And all the trouble to which the cutter goes is counteracted if the care he has exercised is not followed by subsequent operators.

In blanking out the material, scratches often are made which readily could have been avoided had adequate care been taken. The locating pins are another reason for the many scratches noticeable on high-grade silver-plated dials. Here, too, the dials should not be permitted to fall on each other to any great extent.

Scrap Brass for High Pressure

Q.—We are experiencing great trouble with brass cock bodies and valves designed to stand a water pressure of 700 lbs. per square inch. We have adopted every method possible to overcome our difficulties and we are still getting on an average 50 per cent. rejects. We have changed the gating and position the bodies lay in moulds. We particularly desire to use scrap brass.

A.—You have a hard proposition on your hands since you are so desirous of using scrap brass on these high pressure brass goods. Brass scrap is composed of so many compositions and there are many kinds of scrap brass that is entirely unfit for pressure brass goods as they vary exceedingly in their composition. I would suggest you follow the method and alloy used by the leading manufacturers of high-grade steam and water pressure goods and use a virgin metal mixture for the bodies of these goods and see that the patterns and core boxes allow for the correct thickness of the walls of the valves and that it is uniform all around. There must be something radically wrong when you are losing such a high percentage of defects from leakage.—P. W. Blair.

Copper-88, Tin-10, Zinc-2

An Analysis of the Properties, Idiosyncrasies and Methods of Producing This Mixture

Written for The Metal Industry by R. R. CLARKE

The copper-tin alloy is generally supposed to be of pre-historic origin. Relics of unrecorded periods point to a time when man discarded his implements of stone for those of metal. Inference has it that copper alone was at first known and used but found too soft for a cutting edge or enduring form in the tools and weapons of the day. In some way or other the idea of hardening the metal materialized and led to the copper-tin alloy. The discovery of this hardening power of tin is an unknown detail and was most likely accidental. Whatever its circumstances of origin, however, copper-tin undoubtedly antedates authentic record and was in the very beginning what it is now—primarily an industrial and martial alloy. Since the days of stone implements, historians have chosen to express phases of civilization in terms of metal, the Age of Bronze, the Iron Age, and so on. Assuming the inferences correct regarding the age of bronze, the impressive facts appear that back of our modern and highly developed state to which metals and metal craft have contributed so much, stands copper-tin, the pioneer, and that after all these years of study and effort toward hardening copper, we have little, if indeed any advantage over our early and uncultured ancestors.

Copper 88—tin 10—zinc 2, sometimes referred to as "gun metal," "gun bronze," "gear metal," hard bronze," "composition G," etc.—is nominally a copper-tin alloy derived from a copper 90-tin 10 formula and retaining all the properties of the parent combination. The zinc addition at copper expense is of comparatively recent origin and designed chiefly to promote cleanliness and solidity of metal, through its power to reduce oxides and gases, two evils to which straight copper-tin is inclined and against which zinc is known to contend. The 2% zinc addition was probably calculated to be just sufficient to reduce these oxides and gases and to disappear. In the latter respect the calculation is little in error since average manipulation goes a long way toward eliminating the zinc in straight 88-10-2.

The fact is that if, as per government specifications, from 1 to 3% of zinc is to survive manipulations, the 3% maximum at least must be introduced, and even then the casting will frequently index no great margin over the minimum requirement. On different occasions we have known such castings to analyze uncomfortably close to this 1% minimum. It is this strong tendency toward depletion that prompts that sterling practice in some foundries, first to melt and pig the alloy on the 88-10-2 or the 87-10-3 basis, analyze the ingot and then make the necessary corrections when melting for casting. The practice offers the dual advantage of a more uniform mixture and a more nearly correct analysis.

Zinc affects physical property more that might be expected. Much of the benefit is derived, no doubt, from cleanliness and compactness of the metal as influenced by this phase of the zinc function. At any rate, our most satisfactory tests regarding tensile strength and elongation in this alloy were those where chemical analysis disclosed a substantial zinc content. Strictly speaking 88-10-2 is not a logical alloy. Though of strong reducing powers zinc nevertheless relies greatly on quantity and on practice and on a 2% basis cannot firmly meet the issue. Even at its higher percentages as 5%, 7%, 10%, etc. its capabilities can be overtaxed and bad metal result. Highly volatile, its full powers are brief and declining baring the metal to renewed attack and impairment. In this respect zinc slightly resembles charcoal which does its work but is "done" in the doing, while the evils against which both contend suggest a pestering swarm of flies. You can chase them away, but unless you keep on chasing they will return. In 88-10-2 the odds against zinc are unusually heavy. My own experience dictates the absolute necessity of pouring at advanced temperatures if exacting tests are to be met and it is at high temperatures that the staying powers of zinc break down.

In straight 88-10-2 then, the conflicting conditions arise that in order to obtain results we are forced to a comparatively destructive practice in an alloy extremely incapable of standing that practice. The outcome is the all but universal use of phosphorus in manipulating the alloy.

Phosphorus has a threefold effect; it reduces oxides and gases, hardens and makes brittle. The two first-named are desirable; the last named is objectionable in that it impairs physical properties. Common sense practice is therefore to use a minimum of phosphorus consistent with the elimination of gases and oxides.

Good Gun Metal is a strong, hard, comparatively tough composition of constituents, thoroughly alloyed. The grain of cold fracture is fine and uniform throughout resembling somewhat that of pure copper. Fresh fracture shows a pale bronze color unvarying and unblemished. Color and grain show up prominently in thin sections such as those that form around cores in their prints and it is here also that the physical properties of the metal are usually strong. Test bars approximating the color and grain of these thin sections generally prove satisfactory. Interesting points and requirements of the alloy are set forth in form 46M6B issued by the Navy department and available upon application to the Bureau of Supplies and Accounts.

Prominent among others are the following: By analysis the metal must show, copper 87 to 89; tin 9 to 11; zinc 1 to 3; iron 0.06 maximum; lead 0.20 maximum. Physical requirements are: Minimum tensile, 30,000 per sq. in., minimum yield point 15,000 lbs. per sq. in.; minimum elongation in 2 inches, 15%. Castings can contain no purchased scrap metal in their making and must be "clean, sound, free from blow holes, porous places, cracks or any other injurious defects" while color and grain of the metal in fracture sections must be uniform throughout. This specification regarding color and grain is interesting in that it is a criterion of strong, high grade metal. The fact is that by color and grain of cold fracture, one can judge fairly closely the behavior of the metal under test.

Applications of the metal are designated chiefly as cases where strength is required and where salt water is present. Among other citations are valves 4 in. in diameter and over, pipe fittings, gear wheels, bolts, nuts, bearing boxes and shaft casings. An additional feature is a sketch for test bar including a method of gating. This sketch is reproduced in this article. To meet the foregoing requirements it is essential that good grades of material be mixed, melted and molded under the best of practice. Not that these requirements stretch to narrow marginal edges of possibility, beyond the limits of mediocre material, but that the better grades such as Lake or Electrolytic copper, Strait's Tin and Bertha or Horsehead Zinc are by far the more safe, assuring and

productive. The great trouble with mediocre materials is their lack of constancy. We never know the exact states of purity and quality and are correspondingly uncertain as to how they will consociate or what results will follow. "Better be Safe Than Sorry" is an old saw but an apt one in choosing grades of material for gun metal castings required to pass physical tests.

Good material, however, is no guarantee of results. Practice is a great and decisive factor. The far-reaching effect of practice will appear from an actual foundry experience of which we have definite knowledge. They were making impeller casings and using the best grades of material money could buy, but falling down completely in their tests. Elongation dropped as low as 5% and tensile sought correspondingly low and unsatisfactory levels. They tried every thing from making burnt offerings to their Gods to melting small percentages of horseshoe nails in the metal. The latter they actually did on hearsay that the iron would combine and raise physical properties. Practice was chiefly at fault. The trouble ended when the same brands of metal were melted more correctly, alloyed more thoroughly and poured hotter.

The most satisfactory gun metal we have ever made was melted in air and oil furnaces of both the Schwartz or "tea kettle" type and The Simplex or barrel type, the metal in some instances being subject to hydrostatic test, in others to physical property test. Among our more disappointing experiences, candor compels us to include crucible-pit melting and to revise our estimates of the air and oil method regardless of former opinions expressed. We now believe, and not without reason, that the only essentials to high grade metal in air and oil melting are common sense tactics, critical judgment and extreme care. The furnaces must be kept clean and free from slag, the flame strictly reducing, the temperature under strict control and the metal never "soaked." If these precautions and the ordinary rules of good mixing be observed, air and oil to our mind has nothing to fear from the crucible method except perhaps losses in high zinc mixes. One thing is certain; air and oil is much more rapid, and abbreviated periods are undoubtedly assets to good melting practice. The notion that charcoal is inadmissable to the air and oil furnace is more or less in error. Used in bulkier form it can be depended upon to remain and function throughout critical periods.

From a series of tests made in connection with castings turned out, the following results are submitted:

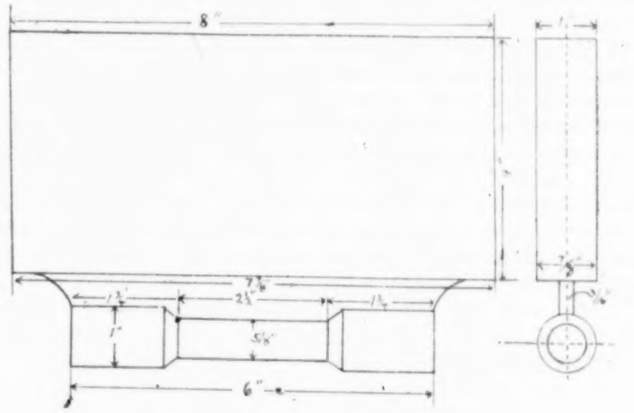
Tensile Strength	Yield Point	Elongation in 2 in.
1—37,000	22,500	203
2—36,900	20,750	28
3—44,650	21,000	309
4—45,350	21,000	42
5—39,000	20,500	281
6—47,000	21,250	42%
7—37,750	19,500	21
8—40,500	20,100	285
9—44,250	20,250	32
10—37,000	19,500	28

The figures represent inconsistency in results, which we may say is not uncommon, and is explained most likely, by variations in conditions and practice in the different heats, variations probably in the thoroughness of alloying, the effects of oxidation or in the pouring temperature. Practice aimed at was the same in all cases, and produced a creditable average over and above requirements. In brief detail the practice follows:

1. Good grades of material were used.
2. The alloy was formulated on the 87-10-3 basis and cast on second melting.
3. The metal was new except gates from other heats.
4. On first melting the furnace was cleaned and well pre-heated, the copper was then charged and large chunks of charcoal thrown in the furnace. As soon as the copper was reduced, tin and zinc were added and thoroughly stirred into the mass. More charcoal was thrown in and the furnace again started and rocked back and forth for about 10 minutes. At 2,100° F. the metal was again thoroughly stirred with a heavy stirring rod heavily coated with clay wash and dried. The metal was then pigged from a clean and well pre-heated 200-pound capacity ladle into the bottom of which broken up charcoal was thrown previous to each filling.

Following pre-heating of the furnace and during entire melting period the flame and temperature were closely watched to guard against undue whiteness or thinness in the flame and to check any sudden and high flight of temperature following the adding of the tin and the zinc. In melting for casting, practically the same detail was observed except that a small corrective quantity of zinc was added in the furnace (the quantity being determined by the appearance of the molten metal) and the metal heated to 2,200° F. before being transferred to the ladle. In making this transfer the ladle was well pre-heated and charcoal placed in the bottom along with 1 ounce of 15% phosphor copper to 100 pounds of metal. In the ladle the metal was finally stirred, hurried to the mold and poured at or near 2,150° F.

Methods of casting test bars differ chiefly between that of ramming the bar patterns up in the same mold with the casting whether the mold be of green or dry sand, and that of using a dry core mold, separately made and embedded in the casting mold. Results can and have followed both ways, though the dry core method is perhaps the safer and better. The form shown in the illustration is as good as any. The entire mold including



TEST BAR FOR GUN METAL

castings, fin-gate and rises can be made in a core. In ramming up the mold for the casting a wood block can be used as a core print, the core mold set in this print and the whole thing cast in the drag of the casting mold by either gating to the top of the risers or dropping down to the test bar itself. The tendency of the metal to show up strong and well in thin sections lends to the belief that sudden chilling or quick setting of the metal is a benefit. To this end chilling the test bar mold has been tried though to our knowledge it has never exceeded results otherwise possible.

The status of metal in a test bar can be approximately judged by different methods. Color and grain of fracture, already referred to is one way. Another is to cast an extra bar, put the end of this bar in a vise and bend by hammering the opposite or free end. If the metal resists stubbornly and bends well onto U shape its chances under test can be considered good. If at an angle of say 60° or less it suddenly snaps, elongation at least is in peril.

Duralumin

Its Properties and Commercial Possibilities*

By WILLIAM B. STOUT, President, Stout Engineering Laboratories, Inc., Detroit, Mich.

A material one-third of the weight of cold-rolled steel yet with the same approximate strength characteristics; a metal which can be heat-treated to higher physical properties yet by a process which does not take effect for an hour after treatment; a possibility for much lighter and at the same time cheaper production in certain lines of manufacture, and in a few words you have a picture of the future possibilities of the new copper-aluminum alloy known as "duralumin."

Receiving its first impetus in the development of aircraft abroad, and particularly by the Zeppelin firm, this metal has been perfected in this country to a point far ahead of the German product, while the work in aircraft of both the airship or lighter-than-air type, and airplane or heavier-than-air machine, has developed processes and methods now applicable to new lines of production.

The new alloy can be rolled into sheets or forged by hand press or power hammer. It can be cast, welded and soldered, while rivets of the same material used with it show new production possibilities on account of the peculiarity of the heat treat resultants. Connecting rods have been made of it, using the metal itself for wearing surface without anti-friction metal. These have operated successfully in both motor cars and aircraft engines. Worm gears have been used made of "dural" as it is colloquially called, and used in heavy truck service successfully against steel pinions. Timing gears of this metal show new possibilities of both wear and quietness, but the most use has been in structural shapes for ultra-light constructions. The metal itself costs about five times as much as cold rolled steel per pound. For production work, however, remember that but one-third the number of pounds is used for the same strength result, while the material being much easier to work than steel in most of its forms saves materially on labor tool cost and tool depreciation, and on enough production items so that in many cases constructions can be made cheaper of duralumin than of steel.

The work we have been following has been entirely along the line of minimum weight structures of fairly large size for aircraft work. The saving of a pound in an airplane structure means the addition of a pound of fuel in flight or a pound of pay load, so that in aircraft more than anywhere else minimum weight is a vital item. Strength is, however, no less fundamental, as an airplane in flight at speed is subject to stresses far greater than those imposed on an automobile on the road or any form of present transport. Imagine having to build a motor truck of two-ton capacity that could run across a ploughed field at 70 miles an hour without breaking up. This alone would be some engineering problem, yet some modern planes of the bomb-carrying type are designed to do and do do this.

Structures are now being built of duralumin which far exceed former strength figures in wood and yet which are lighter than any previous wood-and-cloth airplane constructions. We have at present in process machines capable of carrying twenty passengers at two miles a minute for five hours, and fitted with six hundred horsepower engines, yet the whole machine weighs but the same as a Cadillac touring car. The entire secret of the weight result is of course not all in metal, but it is safe to state that light weight figure could not have been reached with our present knowledge with any other known material.

Many have preferred steel in their experimental aircraft work on the basis that steel in tensile strength was stronger than dural even weight for weight. This is so, but the problem of strength in a structure is not ordinarily of tensile possibilities but of column or compressive strength.

For the same weight, duralumin has about three times the thickness of even its cold-rolled boiler plate counterpart, and five or six times the section of alloy steels of high tensile. The rigidity of a sheet is dependent on its thickness very largely, and while dural is a much more flexible material than steel in equal sections, yet with the greatly increased sections used for equal strength a much greater rigidity is obtained than with steel.

For example, we have produced a rolled section, designed for a maximum column strength, and yet of such shape as to fit production requirements. This section of .035 thickness of metal in a 19-inch column length weighs 7½ ounces and will support a column 4 tons plus. If made of steel of high alloy, its thickness would be, so far as tensile requirements go, about .009, a too great fragility to be trustworthy in a structure on account of the lack of rigidity in such a thin wall.

Duralumin, as we see it, looks very like aluminum except that it takes a high polish, and that when polished the glinting red of the copper in the alloy can be detected.

The polish in ordinary atmosphere is permanent, the metal being non-corrosive to a very high degree. In the tempered state it is almost impervious to salt spray, though in the annealed form salt water affects it.

The chief difference between this and previous aluminum alloys is its property of having its physical characteristics materially changed by proper heat-treatment. This heat-treatment in itself acts differently than with other metals, leading to some peculiar production possibilities.

Like all new things, this metal with its peculiar properties has certain assets and definite liabilities, but even its liabilities, in some cases, can be termed a profit, provided the structures made of the metal are designed to fit the peculiar requirements of the alloy.

The most marked difference in the metal is that the change in physical properties following heat-treatment is not instantaneous but very gradually arises to a maximum after about four days, and during this period not only is the tensile strength increased as high as 50% or more, but the elongation increases from 600% to 800%. More than this, the metal in its heat-treated form can be re-heated and softened for passing through mechanical processes not of too violent a nature, and at the end of one hour come back to its original tempered characteristics. The fact that the extreme properties of the metal are not reached immediately, as in most metals, is of great advantage commercially, as will be explained later.

The heat-treatment of the metal, or tempering, as it might be called, consists of heating the metal to 920-940 degrees Fahrenheit for from 7 to 30 minutes, the time being goverened by the amount of metal in process. The material is then quenched in boiling water. It is then removed from the quenching bath and worked upon as soon as possible. In from one to two hours' time

*Read at the meeting of the American Society for Steel Treating, Indianapolis, Ind.

enough hardening will have taken place so that it will be difficult to work the metal. Where the time involved in making up the place does not exceed one hour and where the bendings or hammerings are not too severe, this process is a thoroughly feasible production method.

This allows us in our airplane work, for example, to heat-treat a coil of sheet metal in a bath of sodium and potassium nitrates, quenching in an adjacent tank of boiling water and uncoiling the sheet or strip, start it immediately through the rolls which form it into the shape desired, having our complete process over and the spar ready for aging within 20 minutes from the beginning of the operation.

It is not my intention to go into any of the technical details of metallurgical study of the scientific side of this new alloy, but rather to point out the numerous possibilities opened by its use and to describe and explain some of the results and processes now being obtained with duralumin, primarily in aircraft work. I will only state that the metal itself is nothing other than a copper-aluminum alloy, the copper running about 4%, and some magnesium, but with zinc as the most detrimental component. For this reason, duralumin is made only from the purest 99% aluminum, so that the impurities in each of the allows from which the metal is formed will not build up a detrimental quantity. It is the inability of the Germans to obtain pure aluminum which has hindered their duralumin alloy from equalling the figures obtained in every-day production from the American product.

The metal itself, however, was developed in Germany from an original French laboratory development. The first real commercial use to which it was put, so far as the public was concerned, was in the metal ships of the Zeppelin Company. One of the reasons for the slow development of the Zeppelin, aside from the problems of airship design itself, was the necessity of developing the metal along with the structure, and it is certain that the material, unless rightly handled, has as many idiosyncracies as a New England spinster, as well as being as temperamental as a coloratura soprano from Grand Opera.

In the early metal considerable trouble was had with corrosion and with sheets, seemingly without reason, granulated, and until the properties and difficulties were worked out, structures built of the material were more or less certain and required frequent inspection. This is still true in very thin gauges which are not very carefully heat-treated, but with pieces of any real section, corrosion is now an almost unheard-of thing.

In the following outline I will give merely our own experiences with the present liabilities of the material, such as things to be watched out for in its use, but in criticizing I would, at the same time, state my belief that duralumin and derivatives which will spring from it will form undoubtedly the mainstay of all future light-weight developments in automotive and kindred structures, and that the use of this metal will grow by leaps and bounds as its marvellous advantages in both structure and production become very generally known and understood.

The main trouble had with duralumin is more or less similar to the problem met in other alloys, that is, the presence of impurities in the ingot, or air bubbles, small in their original forms, but which, when worked out and forged into thinner sections developed defects.

Most of our material is of .035 stock, so that a very small speck of dirt can make a serious flaw in the metal sheet and a very small air bubble can make considerable pipe in the center of the sheet, almost impossible to find except by microscopic examination, added to considerable good luck.

Most of these flaws do not show up until after the rolling. In this case the greatest stress on the metal in putting it through the rolls is at a hidden point, so that to inspect these spars or chord members a dental mirror is used with a high light, and the surface very carefully examined. Frequently a hole as small as the point of a fine needle can be opened up into a flaw five inches long—a sort of stratification of the metal—resulting from original ingot impurities.

At the beginning of our work, spar rejections, for this reason, ran as high as 40%, this gradually being reduced, and it seems possible in the near future that our rejections will be normal. In all these sections there has been no attempt at drawing the metal, but merely bending it, as any attempt to draw the metal results in an extreme number of rejections through crackings. It is peculiar that these cracks may not appear until a number of hours after the piece is made, so that after rolling four days is allowed to elapse before parts can be inspected for cracks or flaws, or before any piece is allowed to be put into the actual airplane structure.

In the design of the rolls great care must be taken against too great a degree of draw between annealings, and that all radii are of sufficient amplitude for the metal.

The great drawback of the material as we are using it at present is the presence of ingot flaws, rolled out in the sheet, which lead to a very high rejection cost. When this is cured, we can say, I believe, that the experimental stage of duralumin is over. As soon as quantities of the material are demanded also rolls can be put in for greater widths of sheet than at present available—sixteen inches being now the best obtainable—and tubing and other structural forms can be made available.

I believe that this material and development from it in better alloys, will eventually be more universally used than steel for structural requirements. Its use in aeronautics is already definitely established, new as its use is, and the all metal plane already given preference to the older types. I believe we will next see it in motor cars, at a savings of over half the weight, and in boats and busses, street and railway, cars, bridges and girders. For the time being, however, it is a material to watch and study, and to make use of conservatively in conservative lines of engineering.

Composition:

Copper	3.50 to 4.00%
Magnesium	.2 to .75%
Manganese	.40 to 1.00%
Aluminum (99% pure)	Balance

Physical properties:

Specific gravity	2.80
Weight .102 lbs. per cu. in.	
Melting range centigrade	540 to 650
Compressive strength tempered	44,000
Shear value tempered	30,000
Tensile strength tempered	50-60,000
Per cent elongation tempered	16 to 20%
Modulus elasticity	10,600,000
Coef. expansion	.00000226 per degree C.
Yield Pt.	30,000

Foundry Mixtures

Gold Metal Mixture

Zinc	10	lbs.
Tin	6¼	"
Lead	6½	"
Copper, 2 oz. to 1 lb.		

Silver Steel

Nickel	1	lb.
Copper	2	"
Zinc	2	"
Manganese	½	oz.
Steel	1	"
Aluminum	¼	"

Iron-Pot Melting Practice for Aluminum Alloys[1]

A Series of Articles Giving a Complete Survey of Present Day Methods in General and a Detailed Investigation of Iron-Pot Practice in Particular—Part 6

By ROBERT J. ANDERSON[2]

LIFE OF IRON POTS

The life of an iron pot varies considerably depending upon the thickness and quality, and also probably upon the chemical composition. Very short life, i. e., a break-out after a few heats, may be properly charged to inherent defects in the pot rather than to furnace conditions or to other causes. Table 7 gives a summary of some reported data as to the life of iron pots in some representative furnace installations, and it will be noted that the variations are rather wide. As shown by Table 7, the number of heats obtained by some representative foundries varied from 20 to 80, and the amount of metal melted varied from 6,000 to 48,000 pounds. The average number of heats obtainable from an iron pot may be taken as about 47, and with a 300-pound pot this is equivalent to about 14,000 pounds of metal. The number of melting hours of life will vary depending upon the speed of melting; thus 300-pound pots of a usual size may have a melting life of 100 to 125 hours while large rectangular pots will have a melting life of 75 to 80 hours. In general, it may be said that when melting continually nine or ten hours per day, a 300-400 pound pot may be expected to give at least eight days of service and will break on the ninth, tenth, or eleventh day. Consequently to avoid the danger, the holding-up of production, and the loss of metal which occurs when a pot breaks, it is common practice to remove the pot from service on say the eighth day and replace it by a new pot. Experience with the performance of pots from a given source will best determine the safe life. Pots are not run as long as they will last, i. e.. until failure, in foundry practice, but they are generally replaced after they have been in service for the period of time of their safe life, as determined by records.

TABLE 7.

Life of iron pots used for melting No. 12 alloy.[33]

Tye of furnace.	Fuel used.	Size of pot, inches: Diameter.	Depth.	Thickness, inches: At the flange.	At the bottom.	Capacity, pounds.[34]	Number of heats obtained.[35]	Pounds of metal melted.
Stationary	City gas	15	15	⅜	0.75	200	24–50	4,800-10.000
Stationary	Natural gas	18	18	0.75	1	250	40	10,000
Stationary	Natural gas	20⅛	15⅝	0.75	1	300	50–55	15,000–16,500
Stationary	Blue water gas	36	30	⅞	1.25	300	48	14,400
Stationary	Gas and oil	16	14	0.5	1	100	30–50	3,000–5,000
Stationary	Gas and oil	..	..	0.75	1	100	[36]	12,600
Stationary	Oil			⅞	1	300	20	6,000
Stationary	Oil	[37]	[37]	1	1.5	1,000-1,200	24–40	24,000–48,000
Tilting	Oil	22	12	0.5	1	200	50	10,000
Tilting	Oil	30	16	0.5	⅞	400	85	34,000

Sometimes, a break-out will occur after a few heats but this is generally due to blows or other defects in the iron-post casting. It is stated[38] by one foundryman that an iron pot made with a green-sand core will last 25 per cent longer than a pot made with a dry sand core. It is also stated by the same foundryman that semi-steel pots last longer than those made of ordinary gray cast iron, and that careful molding, particularly of the sort that insures a clean casting, means much in the life of a pot because aluminum alloys quickly work through any dirty or porous parts of the pot. On the other hand, another foundryman states[39] that longer life is obtained from gray cast-iron pots than from those made of semi-steel. It would be expected that the life of a pot would be a function of the chemical composition of the pot within certain limits, but no accurate comparative test data are available to show even the tendencies.

Few reliable data have been made available by investigation of the chemical composition of iron pots, and most plants reported that they used either gray cast iron or semi-steel for the pots. The chemical composition of pots used in two plants is given below:

CHEMICAL COMPOSITION OF IRON POTS, ELEMENTS PER CENT

G. C.	C. C.	Mn	Si	P	S
3.0	0.45	0.60	2.5	0.45	0.08
3.0	0.50	0.50–0.70	2.75–3.0	0.20–0.30	..

Regarding the failure of iron pots in service, the following causes are either predominating or contributory: Scaling (oxidation on the outside surface), stretching, cracking, breaks due to attack of molten metal, and burning through due to the action of the flames on the outside of the pot. Scaling is one of the principal causes for failure, as is stretching. Scaling, i. e., oxidation of the outside surface of a pot, is owing to the action of free oxygen upon the cast iron at high temperatures. Hence, if an iron-pot furnace is run with a large excess of air or if there are bad air leaks in the furnace shell, the failure due to scaling may be rapid. The necessity for closely controlling the air supply in these furnaces is consequently important, and in some installations the attempt is made to use a reducing flame. Undoubtedly, the life of an iron pot will be longer when a reducing flame is employed than when the furnace is run with a large excess of air at the burner. In some commercial installations, the attempt is made to protect the outside surface of iron pots by a coating of a high temperature cement or by some wash which will prevent oxidation. This practice is not at all general, but some foundries report good results from it. Stretching is simply the deformation and elongation of a suspended pot owing to the weight of liquid charges; failure due to stretching is caused by the pressure exerted by the metal charge

[1]Published by permission of the Director, U. S. Bureau of Mines.

[2]Metallurgist, Bureau of Mines, Experiment Station, Pittsburgh, Pa. Parts 1, 2, 3, 4 and 5 were published in May, June, August, September and October, 1921.

[33]As reported to the Bureau of Mines.

[34]Operating capacity, not actual.

[35]This refers to the number of heats obtained before replacement and not before failure.

[36]Life about 21 days on continuous melting.

[37]Rectangular pot, 16 inches wide by 37 inches long by 26 inches deep.

[38]Private communication, January 4, 1921.

[39]Private communication, January 14, 1921.

contained in the pot at high temperatures. Of course, the strength of cast iron at 900°-1,000° C. is much less than that of the material at room temperature, and a pot will elongate, i. e., stretch, and the depth become greater the longer it remains in service—or until failure occurs. Failures due to so-called stretching are made evident by cracks in the pot and consequently break outs on melting. Any pot which is held in the furnace solely by suspension from the roof is liable to fail by stretching more rapidly than one which is supported at the middle by wedge-shaped bricks built out from the furnace shell or at the bottom by a refractory stool.

Cracks in iron pots are usually attributed to stretching, although they may be due in part to rough treatment of the pots on charging. Cracks may also open after a pot has been in service for a short time; these may have been small cracks present in the original casting which open under stress or under continued expansion and contraction due to heating and cooling the pot. Since light aluminum alloys have a fairly rapid solvent action when in the liquid state on solid cast iron, breaks may occur due to the attack of the light alloy upon the pots. Normally, however, breaks due to this cause arise at some weak or defective part in the pot, such as at a porous or unsound spot. Burning through due to the action of the flames on the outside of the pots is in fact the same kind of a failure as scaling, although if the burner is set so that the flames are projected directly against the pot, failures due to this cause will be more frequent than from ordinary scaling in furnaces where the burner is set correctly. The causes of and methods for preventing failures and methods for increasing the life of iron pots have not been examined in detail, but evidently considerable progress can and ought to be made in this direction.

MELTING LOSSES IN IRON-POT FURNACES

The loss of metal on melting aluminum alloys in iron-pot furnaces, owing to dross and skimmings, is rather high on the average, but usually not so high as in open-flame furnaces. In the open iron-pot furnace, the metal is in direct contact with the atmosphere, and the oxidation loss is a function of the temperature and the amount of stirring, i. e., to what extent fresh surfaces of metal are exposed to the air. The higher the melting temperature, the greater the melting loss, other things being the same. The loss of metal due to skimming the heats depends upon the care used in skimming. If the pots of metal are skimmed carelessly when the dross is removed, much liquid alloy may be taken off at the same time. Table 8 gives some data for the melting losses sustained in a number of iron-pot furnace installations in some foundries in the United States, as reported to the Bureau of Mines. By reference to this table, it will be noticed that the net

TABLE 8

Melting losses for No. 12 alloy in iron-pot furnaces.[40]

Type of furnace.	Fuel used.	Run open or closed.	Operating capacity, pounds.	Net melting loss, per cent.	Gross melting loss, per cent.
Stationary	Natural gas	Open	200	..	4
Stationary	Oil and gas	Closed	280	2	6
Stationary	Oil and gas	Open	100	..	2
Stationary	Oil and gas	Open	100	..	3
Stationary	Oil	Closed	280	..	6
Stationary	Oil	Open	400	3	4.5
Stationary	Oil	Open	300	..	6
Tilting	Oil	Closed	200	1.5	2

[40] As reported to the Bureau of Mines.

melting losses (allowing for recovery of available metal in the dross and skimmings) are from 1.5 to 3 per cent, while the gross melting losses are from 2 to 6 per cent with an indicated average of 3.6 per cent. This may be taken as a fair average for commercial practice. If the dross and skimmings be assumed to contain 40 per cent metallics, the net melting loss would be about 2.2 per cent, on the basis that perfect recovery be made. No data are available which indicate that the melting losses are lower in furnaces run closed, i. e., with covers, than in open furnaces, although it might be expected that oxidation would be less severe if covers were used to prevent free access of air to the surface of the liquid alloy. Melting losses for aluminum alloys are governed, of course, by the type of furnace used, by the melting temperature, and by the character of the charge. The losses will be (and perhaps even considerably) higher if borings and fine scraps are charged.

EFFECT OF IRON-POT MELTING UPON THE QUALITY OF THE CASTINGS

Much uncertainty exists as to the effect of melting aluminum alloys in different types of furnaces upon the quality of the resultant castings, i. e., upon the physical properties, microstructure, ability to withstand pressure, and general casting behavior in the foundry. This is a matter for investigation, and sufficient data are not in hand to warrant a discussion of iron-pot and other furnaces upon a comparative basis. It may be indicated here, however, that sound and satisfactory castings have been poured from aluminum alloys melted in practically all types of furnaces, although in general the iron-pot furnace is regarded as more preferable than furnaces of the open-flame type. Some foundrymen do not approve of the iron-pot furnace because of the constant renewals of pots which are required, while others believe that owing to the fairly rapid melting and the relatively clean metal which is obtained, the iron-pot furnace is preferable to open-flame furnaces. Various opinions have been expressed as to the suitability or unsuitability of iron-pot furnaces, but no comparative data are available as to the relative quality of castings poured from light aluminum alloys melted in different types of furnaces.

It may be said here in a general way that greater strength will be obtained in No. 12 alloy melted in iron-pot furnaces rather than in crucible or open-flame furnaces owing to the dissolution of iron from the pots. This alloy, and related light aluminum-copper alloys, will contain roughly 1-2 per cent iron, while the same alloys melted in a plumbago crucible or against a refractory lining will contain about 0.4-0.75 per cent iron, on the basis that primary melting stock of a good grade is used and no scrap is employed other than scrap previously melted in the same type of furnace. The micro-structure will be affected of course by the presence of iron, and also by the presence of much silicon. Silica is reduced by aluminum from plumbago crucibles (from the contained fireclay) and from refractory linings containing silica, or silicates, yielding silicon. It would appear that the ability of a casting to withstand pressure would be affected by the type of furnace used for melting as determined by the melting temperatures and the furnace gases in contact with the alloys. So-called "hard spots" are likely to be of more frequent occurrence in castings poured from alloys melted in iron-pot furnaces. Hard spots, as will be explained in detail later, are due in part to the inclusion of small pieces of hard accretions which build up on the inside of a pot. Such inclusions do not occur in castings poured from alloys melted in other types of furnaces.

This paper will be continued in our later issues.—Ed.

Alamagoozalum Alloy

Troubles with Aluminum and Manganese Brass and Bronze

Written for The Metal Industry by WILLIAM H. PARRY

During 1920 the technical press published the findings of a committee appointed by a technical society to revise or rather to re-name the various non-ferrous alloys, many of which had been sailing under false colors ever since they became common property. This is not written as a criticism of the committee's report, as their work was very thorough, and will be accepted by the trade generally as the last word in non-ferrous metal nomenclature.

There is one bronze that is not mentioned in the report by its correct name, which is, A-la-ma-goo-za-lum, the same, being freely interpreted, meaning, watch your step. I refer of course to our old, tried, and found wanting, aluminum brass, aluminum bronze, manganese brass, manganese bronze mixtures, which were invented by the devil for the express purpose of destroying the peace of mind of all good brass foundrymen. Who of us old timers will fail to remember how joyfully we hailed the discovery of these mixtures, which can be traced to the time when the manufacturing of aluminum became a commercial possibility, and its price fell from its laboratory peak to the valley range of any founder's pocketbook? How we fell for the bunk that any of these mixtures would excel steel in tensile strength and percentage of elongation, though it must be admitted that such was the case now and then. But as no two batches of the same mixture ever showed similar, or approximately similar results, our faith became sadly shaken. Yet we followed the rainbow to the end where the pot of gold was supposed to be hidden, only to find a dirty yellow mass in the pot which more resembled fools gold than the Spanish Doubloons we expected to see.

A very close study of about all the technical books dealing with the non-ferrous alloys fails to reveal any great difference between the so-called Aluminum brasses and bronzes and the manganese brasses and bronzes, other than the very wide latitude allowed between the relative percentages of copper and spelter in the four alloys. According to the text books there must not be any aluminum present in the analysis of manganese brass or bronze. We know from experience, though, that there is very apt to be more aluminum present, than there is in aluminum brass or bronze, and so it follows throughout, that the mixtures are so interwoven with one another that the term alamagoozalum is hereby applied, without copyright and full rights not reserved.

Assuming then that the actual differences between these alloys are so remote and become more so after the gates and sprues of one heat are charged with those succeeding it, a recital of the troubles that beset at least one foundryman in his attempts to produce sound castings may be of some interest.

Gas engine connecting rods are a very important moving part, and are usually made of steel forgings, which is the proper practice, but in this particular instance the designing engineer did not believe it—**then.** The specifications called for 90 copper, 10 aluminum and a hundred castings were made without much trouble other than the use of immense shrink heads at both ends to compensate for the unequal sections. The castings were beautiful to look upon, and were in due time sent to the machine shop.

On the Prony Brake test for horse-power, about one-half of the connecting rods curled up like sick pups, while the other half stood up to the work. An examination of those suffering from the bends, revealed the presence of porosity and oxide. After trying all kinds of stunts to produce reliable castings, covering a long period of time, the attempt was declared a failure.

Some years later the matter was again taken up, and another and more serious attempt was made to make pressure castings, to stand up to 250 pounds hydrostatic pressure. In the interim between these two trials we had been reading much that was printed on the subject, and, while but few of the writers admitted failure, the consensus of opinion was that these alloys were extremely hard to handle, and success was possible only when pouring temperatures, shrink heads, molds, cores, gates, sprues, runners, risers, etc. were relatively right and made in Heaven.

All the writers were unanimous on one point only, that new ingot must be used to start with, regardless of the fact that all succeeding heats must of necessity include some of the preceding melt's residue, unless same was disposed of to junk dealers, at prices below that paid for the original ingots, thus giving economy an awful kick in the bustle.

After trying to follow about all of the above named conditions and failing to produce any pressure resisting castings, there was nothing left to do but to reason out other means based on these repeated failures.

We found that while pouring temperature is an important factor, furnace temperature is much more so, in that care must be exercised that the metal is not burnt, as then all the cooling off tricks resorted to will not save that batch of metal. On the other hand the metal can be underdone, so much so that it is almost in a plastic state, and without fluidity enough to flow properly. Between these two conditions is the right temperature, and to put it down in figures of Fahrenheit or Centigrade is more than I am able to do, as no pyrometric readings were taken and we would not have believed them if they had. The pyrometers made at that time were about as reliable as newspaper weather predictions are now.

Shrink heads for castings of unequal sections, if placed properly, which means, not always in the immediate vicinity of the heaviest sections, will give good results at times, and again will not, if provision has not been made to overcome the excessive contraction at the point between the heavy and light sections. A hard and fast rule cannot be laid down to govern the placing of shrink heads, as designs are as various as the stars are numerous. This much can be said however, that it is useless to feed a heavy section if by doing so destructive contraction is created elsewhere.

It is all very well to strive for the solidity of the hubs, bosses, flanges, and other heavy sections of a casting, but what of those sections adjoining, which will show porosity of the cavernous type if smaller heads are not placed there also? Better by far core out all hubs and bosses, and taper off the metal from the flanges to the body of the casting gradually, or through the medium of very big fillets.

The proper making of a mold so that Alamagoozalum will rest quietly, within it, is not such a hard stunt for an experienced molder to pull off, if he bears in mind that the drier the mold the better, in fact the dry sand mold is the ideal one for any metal. While many so-called experts are opposed to its use on the basis of

economy, it has proved to be the most economical in the end, if sound castings only count.

Cores must be made so that when the excessive contraction for which old alamagoozalum is noted takes place, the core will crush easily.

If any trouble is experienced with cores not crushing easily, mix the flour of anthracite coal ashes in each batch of core sand mixture, in the proportions of one to fifty or sixty. Flour of anthracite coal ashes is made by riddling furnace ashes through a number ten or twelve riddle. We found that the most important feature of all operations in the making of pressure castings lay in the gating, and it is a safe bet that the loss of most castings when handling this treacherous alloy can be traced to a disregard of the importance of how the metal is fed to the mold through the gates.

Assuming that the gates have been properly placed in their relation to the casting (and not every slob can do this little thing) the next step is the design of the gate itself. Following the usual practice we made the gates of liberal dimensions and with but little space between sprue and casting; this we found was the very worst condition possible, as the castings were shot full of oxide, and between the pull of the sprue on the one end, and the casting on the other, when contraction took place, the casting was the sufferer.

Again, a close examination of the castings showed oxide present from the point of entrance of metal thence in a path of fan-like contour for a considerable distance visible to the naked eye, which proved that something must be wrong with the gate design.

To make a long story short, we placed the sprue as far from the castings as the flask dimensions would permit, and midway between it and the casting we put a strainer core, semi-circular in shape, on edge; this method gave us a lot of good castings, but we could not make them all good.

Much can be written about sprues and their relation to good castings. Perhaps the best advice to hand out on this matter is Lincoln's answer to a question as to how long a man's legs ought to be, which Old Abe decided was just long enough to reach from his body to the ground. So it is with sprues. They ought to reach from the top of the cope to the runner or gate and be big enough to take the flow from the ladle, and placed not as near to the castings as possible, but as far. In case there is a battery of patterns on a plate or gate, a runner is necessary, so placed that it provides for the inflow of metal and distributes it through the gates to the castings. A decent regard for the proportions of the cross section of all runners relative to sprues and gates is always in order.

There is nothing gained by making the cross section of the runner twice that of the sprue, or the sum of all of the gates; a trifle less than the area of the sprue would be better, and as the castings are not usually all filled at the same time, this rule works well for ample gate supply also.

The efficiency of risers in the casting of pressure work did not materialize when handling this alloy, which is contrary to all rules when casting any other metal. But, as old alamagoozalum is in a class by itself it was not to be expected that rules which apply to the handling of respectable metals, could ever have any appreciable effect on this species of Bolshevist composition. All risers examined were the soundest parts, and we used to hope that the castings were all risers, for then our troubles would be over.

It will be remembered that pretty much all the earlier makes of automobiles were equipped with starting levers, foot brakes, cranking handles, and what not, made of this alloy, but it proved to be so treacherous and unreliable that the cheapest machine on the market does not use it to-day, not even for a radiator cap.

The Year's Progress in Metals

Annual Review of the Progress Made in the Metallurgical Discoveries of Metals and Their Alloys, and Their Application to the Industrial Arts—Conclusion*

Compiled for The Metal Industry by R. E. SEARCH, Exchange Editor

CALCIUM

Notes on Calcium, in a paper by P. H. Brace, read at the annual spring meeting of the Institute of Metals in London, March 9. He describes a type of apparatus for the manufacture of the metal which is obtained by the electrolysis of fused calcium chloride.

MAGNESIUM ALLOYS

The magnesium alloy **"Electron,"** by S. Beckinsale, was described with analyses, density, microscopical examination, machining properties, etc., in the November issue of The Metal Industry.

In the Zeitschrift für Metallkunde for February, Bd. 13, Heft 3. pp. 73-4, is a criticism of the German and American magnesium alloys under the title of "Dow Metal" which it is claimed is almost the same alloy as that made by the Fabrik Griesheim-Elektron, Frankfurt a.M., which was put on the market in 1909. It states that the essential difference in the sphere of application is that the American alloy has until now been used almost exclusively for motor-frames, while in the German industries their electron alloy has been introduced for a vast number of purposes and the limit of its applicability has never been attained.

*Part 1 was published in January, 1922.

TIN

Hot Tinning. Methods of treating bronze, brass, gray iron and malleable iron for hot tin coating with interesting details of the various processes by Wm. H. Parry in October issue of The Metal Industry.

Analysis of Refined Tin, by W. H. Jacobson, methods and results, in October issue of Metal Industry.

War Experience in Electro-Deposition of Tin, Ni, Brass, and Zn. in August issue of The Metal Industry.

Investigations of the volume alterations of **Tin-Amalgams,** by C. Koller, Zeitschrift für Metallkunde, Bd. 13, 1-19. The coefficient of expansion at first decreases by heating or remains approximately the same, at a higher temperature it increases and reaches its highest value in the vicinity of its melting point. The volumes are different according to whether the investigation temperature is a rising or a falling one. All tin-amalgams also show an alteration of volume at a constant temperature.

Tinning Methods and Tin House Equipment, by C. F. Poppleton, in Iron Age, 107, pp. 187-91.

TUNGSTEN

Manufacture and uses of Tungsten. Mining and Scientific Press, 122, pp. 879-80.

TUNGSTEN-NICKEL ALLOYS

In the Zeitschrift anorganische und allgemeine Chemie, Bd. 116, pp. 231-42, R. Vogel describes a method of melting in which the fusion takes place without protection from the air. He mentions as especially destructive the super-cooling up to 200 deg. C. The author regards the crystal formation of Ni_8W as a compound.

ZINC

Zinc and Zinc-Rich Alloys. Zeitschrift für Metallkunde, 13, pp. 386-89, gives a critical review of Haughton's address to the Institute of Metals. Treats of commercial zinc, physical and mechanical properties and comparison with German investigations of zinc-alloys.

Behavior of Zinc in Impact Tests, by E. H. Schulz and R. Fiedler, Forschungsarb. Geb. Ing. Sonderreihe. M. (1), 29-31.

DEPOSITION OF METALS

Deposition of Metals on Wax, by Samuel Wein. The processes and methods of application are described in the February issue of THE METAL INDUSTRY.

A Symposium on Electro-Deposition and Electro-Plating, held at a joint meeting of the Faraday Society and the Sheffield Section of the Institute of Physics, referred to in detail in February issue of THE METAL INDUSTRY.

The Bureau of Standards has published technologic paper No. 190 by G. B. Hogaboom, T. F. Slattery and L. B. Ham on **Black Nickel Plating Solutions.** Investigations showed that for the purpose very complicated solutions were frequently employed and at times very great difficulty was encountered in producing uniform results. This paper describes the results of a few experiments upon such solutions and contains recommendations regarding the composition and conditions of operation that will yield satisfactory results. See abstract in June issue of THE METAL INDUSTRY.

Abstracts of papers delivered at the Annual Spring meeting of the Americal Electrochemical Society, include the Use of Fluorides in Solutions for Nickel Deposition, Ductile Electrolytic Nickel, Recent Progress in High Frequency Inductive Heating, Electrodynamic Forces in Electric Furnaces, in May issue of THE METAL INDUSTRY.

FURNACES

Comparison of Electric Furnace Practice With Fuel Fired Furnace Practice. The author's conclusions that the cost is the same, provided intelligent operation is pursued. N. K. B. Patch in November issue of THE METAL INDUSTRY. Discussion of this subject continued in December issue.

Gas-Fired Melting Furnaces are discussed by Heinrich Lininger in Zeitschrift ver. Gas-Wasserfach. 61, pp. 2-4, for melting alloys to replace coke-fired furnaces.

Gas Furnaces for Melting Non-Ferrous Metals. M. A. Combs in Chemical & Metallurgical Engineering, 24, pp. 575-6, discusses the comparative merits of coal and oil as a fuel for melting non-ferrous metals. He states that gas is superior to coal because combustion can be more easily controlled and the cost of storage, metal loss and refractories is less. Costs for the crucible melting of 100 lbs. of brass with gas at $1.20 per thousand cubic feet, coal at $16 per ton and oil at 16 cents per gallon are for coal-firing, $3.32; oil-firing, $2.21; gas-firing, $2.21. The cost of refractories for gas-fired furnaces is less than for electric furnaces.

Electric Melting of Non-Ferrous Alloys, by H. W. Gillet, in Foundry, 49, pp. 468-74.

High-Frequency Inductive Heating, by F. Northrup, in Foundry, July 15th, pp. 573-5. Uses a vacuum furnace for high temperatures in an electric melting furnace. Melting of fine Muntz metal in Philadelphia. Non-conducting crucible furnace for heat treating. Tilting 60 kilowatt melting furnace with a capacity of 300 kg.

The Ajax-Wyatt Electric Furnace described by J. Kershaw in Engineering, 82, p. 5. Resistance effect and type of construction, produced on the basis of new experience. Advantages and disadvantages.

MISCELLANEOUS

Loss in the Making and Casting of Brass and German Silver in the Foundry. Giesserei Zeitung, 20, pp. 289-90.

Heat Lost in Furnace Construction. Zeitschrift Giessereipraxis, 42, pp. 461-2. Influence of time of heating, the size and nature of the outside furnaces and means of heat protection upon the loss. Heat loss by different constructive materials.

Specifications of Electroplating for the Automotive Industry, by W. Blum, of the Bureau of Standards, in Automotive Industry, 44, pp. 1289-93.

The Application of Electrical Welding in carrying out the principal of combining materials. Betrieb. 3, pp. 703-7. Application of electrical contact—point—and electric-arc welding as well as the electric heating chiefly for the execution of the compound methods. Combination of iron and brass, silver and brass.

The Deposition of Black Nickel in solutions without the use of Cu, As, or sulpho-cyanate salts. Described in the January and February issues of THE METAL INDUSTRY by Joseph Haas, Jr.

Metal Plating, a series of articles on the subject: Silver in the January, Gold in the June and Iron in the April issues of THE METAL INDUSTRY, by W. K. Knox.

In the December issue of THE METAL INDUSTRY is a fine article on **Electric Silver Melting** by H. A. Defries.

Some Problems in Non Ferrous Metallurgy are discussed by Dr. J. H. Ransom in the December issue.

Core-Baking Ovens, Electrically Heated. In the Electric Review, 78, pp. 132-4, J. L. Jones describes a new thermo-stat consisting of a strip of porous refractory material impregnated with a non-conducting material up to a given temperature but conducting above it. The strip is supported by silver terminals and connected to a suitable relay, motor driven switch and small transformer. The impregnating material regulates the temperature required for core-oven work and is capable of controlling temperatures from 65 to 800 deg. C. The weight of core plates should be reduced to a minimum consistent with stiffness Tables show percentages of various ingredients in core materials and the strength of cores made under various conditions in electrically heated ovens.

In the November and December issues of THE METAL INDUSTRY is a review of the scientific papers presented at the Birmingham Meeting of the British Institute of Metals.

The **Crystalline Structure of Calcium,** by A. W. Hull, Physical Revue, 27. No. 1. pp. 42-44, states that the Röntegen ray analysis gives a flat centered cubical lattice. The side of the elementary cube amounts to 5.56 angström (a minute unit of length equal to one ten-thousandth of micron or one-hundred millionth of a centimeter, used in expressing wave lengths of light).

Structure of Gold Amalgams as determined by metallographic methods by S. A. Braley and Schnieder, Journal American Chemical Society, 43 No. 4, pp. 740-6. In the gold-mercury system there are two eutectics and three constituents. Au_2Hg, Au_2Hg_5 and $AuHg_4$. At the meeting point of Hg, $AuHg_4$ is decomposed into Au_2Hg_5 and Hg.

Hot Tinning

The Reorganization of a Department for Tinning Steel Cans

Written for The Metal Industry by S. R. GERBER, Industrial Engineer, Member A. S. M. E.

In one of the large manufacturing concerns in the east the writer supervised a thorough investigation in the pickling and tinning process of a large steel can. The difficulties encountered in the pickling department and in the tinning department were of such nature as to require a number of additional operations and unnecessary expense in an attempt to produce high quality tinware. On account of "rule of thumb" pickling methods, hundreds of gallons of acid were wasted monthly and yet the results were not uniform. Poor pickling and etching resulted in poor tinning. Consequently over 50% of the cans had to be re-tinned and in many cases, re-pickled also. The investigation disclosed that mixing of the acids, the strength of the lye solution, and the length of time the cans were left in the various solutions, were left to the judgment of the operators. A general lack of care and cleanliness added to the difficulties in obtaining high quality tinware, and increased the number of defects. After a thorough study of conditions, standard formulae were adopted and standard time for each bath was established. The number of men required on this job was reduced from 16 to 5, and the 5 men produced twice as many cans as were turned out by the 16 men, with defective work reduced from 50% to 5%.

The following is a description of the method used previous to the investigation and the formulae used, supplemented by the standard formulae and method adopted and now in use as a result of the investigation.

REMOVE OIL

The cans were washed in an alkali solution, the effect of which is to saponify the animal fats on the surface of the steel. The saponified oil which is now soft soap, is readily washed off leaving a surface free from grease for the acid to act upon. There was no definite time allowed for this operation since the time required to remove the oil depended on the strength and temperature of the solution. The time the cans should remain in the lye was left, consequently, to the workman's judgment. When he thought the cans were in the lye long enough, he transferred them into an adjacent hot water tank. This was done to prevent the alkali from being carried into the acid. In the same way the operator judged when the cans were to be removed from the hot water. When the hot water tank was needed the cans were removed and placed on the floor to cool.

PICKLE

For removing the rust and slag, a solution of hydrochloric and hydrofluoric acid was used in the following proportions:

Hydrochloric Acid	3 parts
Water	1 part
Hydrofluoric Acid	3/10 part

This mixture has a great affinity for impurities on the surface of the steel; but has slow action on pure metal. The effect of the hydrochloric acid is to remove the rust or iron oxide. The chemical reaction produces a soluble salt, chloride of iron, which is readily dissolved in the water. The hydrofluoric acid has an etching effect on the slag. Slag is a silicon compound which is readily acted on by the hydrofluoric acid.

The cans were taken from the floor with a long hook and placed into the tank containing these acids. They were set in here two high; first one layer of cans were set on the bottom of the tank with the open end up, then another layer was set on top of this, sitting into the first layer of cans. Here, too, the length of time the cans were allowed to soak was left to the judgment of the pickler. He kept the cans in longer when he thought the acid was weak and less time when he thought it stronger. He sometimes removed one can from the bath andwashed off the black sediment which had formed on it, to see if it was sufficiently pickled. If he thought it was good enough, he removed the entire batch and placed them into a tank of cold running water, otherwise he left them in the bath a little longer.

SCRUB

The next step was to remove mechanically the rust and impurities which had not been removed chemically. The scrubbers removed the cans from the cold water, using a long iron hook, and placed them, one at a time, into a tank of warm water to remove most of the acids so that the acids would not affect the scrubber's hands. In this operation the following equipment was used:

A bench with two revolving brushes and two pockets containing coarse carborundum (No. 8). The carborundum was placed in the brush and the bad spots in the cans rubbed over it as the brushes revolved. This was not done to all cans, but only to the ones that these workmen thought necessary.

After this operation the cans were again washed in warm water and should be, then, ready for etching. But on account of the handling of the cans during the scrubbing operation there were grease spots present again which had to be removed before the etching operation.

REMOVE GREASE SPOTS

The cans were taken from the truck and placed on the floor near the lye tank. The man at the lye tank hooked the cans up from the floor and placed them in the lye tank. After a short interval he looked at one to decide if they had been in the lye long enough and if he thought it looked right, he removed them and placed them in the hot water tank. When he wanted the hot water tank to place in more cans from the lye tank, he removed the cans from the water and placed them on the floor near the etching tank.

ETCHING

The etching process is necessary to make the tin amalgamate with the steel more readily. The can is composed of two kinds of surfaces, the bottom, which is a cold rolled surface and practically in the same condition as the original sheet; and the sides, which have been drawn and formed so that the smooth hard surface is considerably rougher.

The acids in the first pickling bath remove the rust and scale but do not produce an etched surface necessary for thorough tin plating. To accomplish this, the following process was employed:

The cans were first placed in the tank of copperas nitrate of iron which is a solution of ferric sulphate and nitric acid. The ferric sulphate is reduced to ferrus sulphate which is replenished by the nitric acid, making again, ferric sulphate. From this it would appear that the solution can be kept up to full strength by merely adding nitric acid at regular intervals.

But the impurities and also other chemical reactions which take place make it necessary to renew this solution frequently to obtain uniform etching.

This solution had a weak etching effect on the cans, but sufficient to partly etch the hard surface on the bottom of the cans without destroying the sides.

The length of time the cans were allowed to remain in these baths was based on the worker's judgment. He took a can out of the bath and looked at it to see if it had been sufficiently etched. He based his judgment on the general appearance of the can, its color, the regularity of the black coating it had obtained in this solution, or sometimes he wiped off the black sediment to look at the condition of the steel. When he was behind with his work, he "took a chance."

After this the cans were placed in a tank of dilute, boiling sulphuric acid. This was a stronger etching bath in which the cans stayed for about five or ten minutes and were removed and placed in cold water. The ferric sulphate etch had made the whole surface of the can nearly alike by etching the bottom without overetching the sides; and the sulphuric etch thoroughly etched the entire surface. On account of the evaporation that took place during the boiling of this dilute sulphuric acid solution, it was found necessary to add water frequently. The quantity of water added was, of course, not measured, so it was soon found that the solution was too weak; then acid was added, without measure, and the solution became too strong. This made a very uncertain pickle and was the cause of endless difficulties.

FINAL PICKLE

The cans were now carried by the next man into a solution of hydrochloric acid. This acted as a sort of final wash, removed all other acids from the can, and prepared it to be placed into the tinning flux, which contained also a large surplus of hydrochloric acid. After allowing the cans to remain in this acid for a short time, they were carried to a tank of cold water which floated the cans into the tin room. This tank of water was used to avoid handling the cans and to keep them from rusting while they were waiting to be tinned.

TINNING FLUX

Before tinning, the cans were removed from the water and dipped into a tank containing tinning flux, which consists of chloride of zinc and chloride of ammonia. The zinc chloride serves to consume the water on the can and obviates the danger of water coming in contact with the molten tin during the tinning operation. The chloride of ammonia, or sal-ammoniac, is used as a deoxidizing agent. The chemical reaction is as follows:— $2NH_4Cl+SnO=2NH_3+H_2O+SnCl_2$. The sal-ammoniac coming in contact with the yellow film of stannic oxide on the molten tin breaks up the stannic oxide producing a chloride of tin which remains on the surface of the molten tin as dross, and gives off the free ammonia. Without the use of sal-ammoniac in the zinc chloride, the film of stannic oxide on the tin breaks up in globules and mixes with the tin and remains in the globule form because stannic oxide does not melt at the melting temperature of tin. These globules of stannic oxide settle on the cans causing defective work.

TINNING

The following process was employed in the process of tinning the cans. First the can was dipped into a pot of molten tin and placed on a sheet metal table. Here another man rubbed the can all over, inside and outside, with a piece of waste which had been dipped in powdered sal-ammoniac. The chloride of ammonia was used here to break the film of oxide of tin which forms immediately on the surface of the tin when it is removed from the tin bath.

On account of the large volume of ammonia fumes given off in this operation it was impossible for the operator to do the job thoroughly.

After this the can was again dipped in the tinning flux which acts now as an etching agent because the hot can comes in contact with the free hydrochloric acid in the tinning flux, which is similar to placing the can in a bath of boiling hydrochloric acid. From this bath the can was dipped in a second bath of molten tin, which was kept cleaner than the first pot. The second dip served to cover parts of the can that were not entirely covered in the first dip. The can was then passed over to a third tinner who dipped it again in a bath of molten tin for a final clean tinning.

When the tinning operation was completed the can was dipped into a bath of palm oil at the temperature of the molten tin. This dip served to sweat off the surplus tin on the can. From here it was dipped into cold kerosene oil, held in a jacketed tank, to freeze the tin and cool the can. It was then dried in a heated vat of sawdust to remove the oil and finally handled by another man in a vat of clean sawdust where it is polished and inspected.

The following sketches indicate the layout of the pickling and tinning rooms and the arrows indicate the course of the cans during the process described above.

As a result of the investigation the process was changed to eliminate a number of the operations which were found unnecessary and harmful. The history of the development of the original process is similar to the history of a great number of methods employed in large manufacturing plants. When the tinning was found unsatisfactory, the reason was not sought, but instead, more operations were added. As in this case, poor tinning was caused by weak acid solutions or solutions that were too strong, insufficient time in the pickling or etching baths or both, weak lye solutions, too strong lye solutions or insufficient time in the lye bath, or weak tinning flux, and finally by dirty tins in the pots. Any of these causes would produce defective work, yet when bad work was found one of the remedies attempted was to scrub the cans as described above after the first pickling operation. This operation, on account of the handling made it necessary to add another alkali bath. The second alkali bath in turn caused some lye to be carried into the etching baths which neutralized the acid there. Consequently the etching solution was spoiled causing an excessive use of acid. And so on, in a vicious circle.

This problem then resolved itself into establishing standard times in the various solutions and standard strength and temperature of the solutions.

The required strength of the baths were determined by experiment. In the case of the lye bath, the strength of the solution used was entirely too great. It seems that when there was trouble on the job one of the things that was done to remedy it was to add more lye to the bath. But where a 12° Baumé solution of lye reacts with the oil on the steel and forms soft soap which readily washes off in water, a concentrated lye solution acting on the oil forms hard soap which sticks to the can and does not allow that part of the can to become clean. It was then established that a definite quantity of lye be added to the lye bath daily to keep the solution at 12° Baumé and that the lye bath must be kept boiling while in operation.

The pickling solution was also fixed at regular intervals to keep it above 15° Baumé.

The scrubbing operation which followed this pickle was tirely eliminated, and consequently the second lye wash was unnecessary.

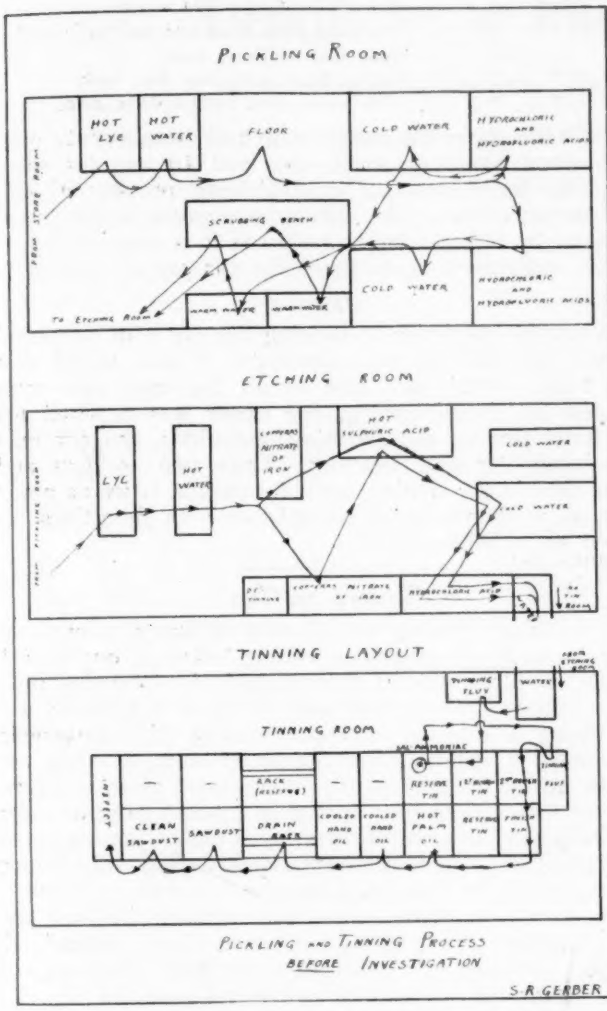


FIG. 1. PICKLING AND TINNING PROCESS BEFORE INVESTIGATION

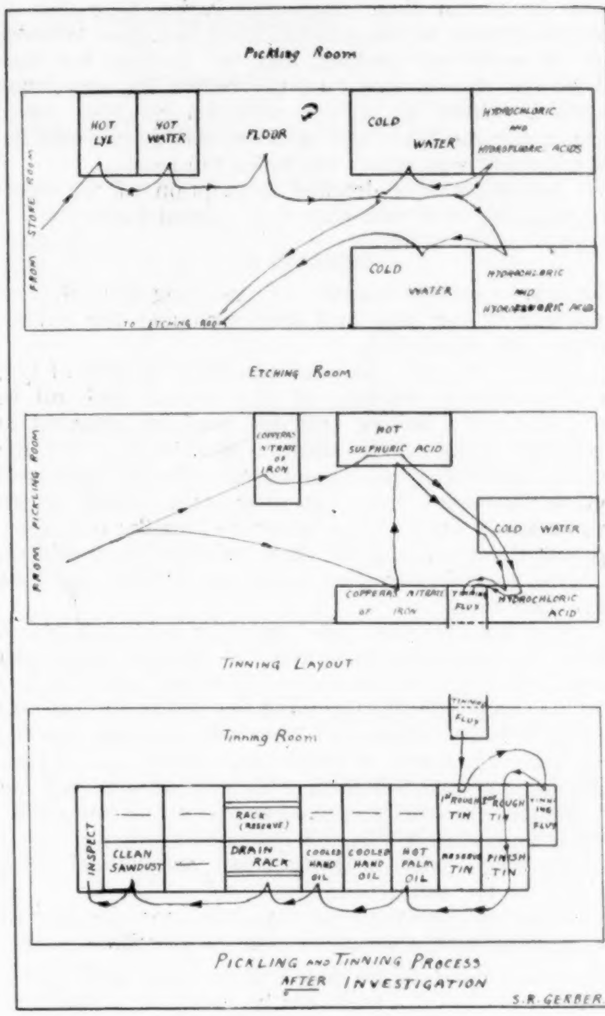


FIG. 2. PICKLING AND TINNING PROCESS AFTER INVESTIGATION

The experiments with the etching baths resulted in a formula that served satisfactorily for the given length of time the cans were allowed to rest in this bath. Instead of, as was done before, changing these baths once a week or whenever the pickler thought they should be changed, it was decided to empty the tank every night and fill them with a fresh solution daily. This plan, beside saving considerably in the quantity of nitric acid and copperas that was consumed, insured a uniform daily etching bath, resulting in uniform quality. This also made it possible to adopt a definite time for etching.

To secure a uniform tinning flux, a pig of metallic zinc was kept in this bath all the time. The zinc reacted with the hydrochloric acid that was carried into the flux from the preceding hydrochloric acid bath and produced zinc chloride, thus avoiding a surplus of hydrochloric acid in the flux. Ammonium chloride in definite quantities was also added to this bath daily.

When all this was established it was unnecessary to rub the cans with powdered ammonium chloride after the first tinning operation.

The following is a list of the formulae finally adopted in the work:

Solution	Formula	Temp. in °F.	Hyd. in °Bé.	Remarks
TINNING FLUX	Tinning Flux... ..		50	Add zinc to keep up strength.
LYE	Banner Lye Water	212	12	Must be kept boiling when in use.
SULPHURIC PICKLE	6 gal. Sulphuric (66) 110 gals. Water.	195	7	Add Sulphuric Acid when action becomes less violent.
COPPERAS PICKLE	6 gals. Copperas 6 gals. Nitric (40) 110 gals. Water	90 Max.		Add Nitric Acid when rust begins to appear in Pickling.
HYDROCHLORIC PICKLE	Hydrochloric (20)		20	Must be kept above 15° Baumé.
HYDROCHLORIC HYDROFLOURIC PICKLE	3 parts HCL (20) 0.3 parts HFL (30) 1 part Water.. ..		16	Add HCL to bring up to strength.
WATER TO REMOVE LYE	Water	200	-2	Must be kept running.

The problem which still remained to insure a uniform good quality can was to fix the time in each bath without depending on the not infallible human element. To rely on the memory of the operators would surely result in failure. Therefore a number of men were removed from the job and the two best were selected for the pickling and etching operations. These two men were supplied with sufficient work on a definite routing so that once they placed a batch of cans in the bath, they could not come back to it until the other baths were attended to. This was calculated in such a manner that the time required to complete a cycle was equal to the time the cans

should remain in their respective baths. Previous to the establishment of this scheme, each bath was attended to by an individual pickler, and he watched his tank until he felt that it was time to remove the cans, then proceeded. Often he waited until his neighbor asked him to empty the tank, and at other times he would become impatient and empty the tanks too soon.

The following is a detailed description of the operations showing how this plan was carried out:

PICKLING

The first operation consists of removing the oil from the surface of the cans and then removing the oxides. This was one man's job.

To remove the oil, cans are placed in a bath of lye, with a hydrometer reading of 12° Baumé, and left in there with the lye boiling until the man has attended to the pickling baths. This allows sufficient time for the oil to be removed, about 25 minutes. He then proceeds to remove the cans from the rinse water tanks, which have previously been placed in there from the lye tanks. He places these cans on the floor to allow them to cool and drain, and also for the inspector to pick out split or wrinkled cans.

He then removes the cans from the acid and places them in the cold water tank and fills the acid tank with the cans which are on the floor. The cans must be left in this acid long enough to remove the oxides and liberate the film of black sediment. The time it takes for the man to make his round of operations (about 25 minutes) is sufficient for that. The man then returns to the lye tank, removes the cans and places them in the hot water, and then immediately fills the lye tank again.

Twenty large cans or thirty small ones constitute a batch for the lye and acid tank.

The order of operations necessary to keep the cans in the various baths the required time is as follows:

1. Place cans from lye tank into hot water tank.
2. " " " truck into lye tank.
3. " " " hot water tank on floor.
4. " " " acid tank into cold water tank.
5. " " " floor into acid tank.

The underlying purpose of this routine is to utilize the pickling and washing equipment to its fullest capacity by filling a tank as soon as it is emptied and to insure sufficient time for washing and pickling.

ETCHING

This operation is done by one man. The etching is done in two baths. One, a solution of copperas nitrate of iron and nitric acid and the other a dilute solution of sulphuric acid at boiling temperature. To prevent the sides from getting "burned" before the bottom is pickled, the cans are first put into this slow pickle of copperas nitrate of iron which opens the stock of the bottom of the cans without much affecting the sides. The cans are then placed in the fast pickle of hot sulphuric acid to hurry the etching over the entire surface.

The length of time that the cans remain in the various baths is fixed by the amount of work the man has to do. This allows the cans to be from 16 to 20 minutes in the copperas pickle and from 8 to 10 minutes in the acid bath. There are two tanks of copperas to one of sulphuric acid which allows the cans twice as long in the copperas as in the sulphuric acid. The tanks hold eight large cans or ten small ones.

The order of operations as carried out by the pickler to give the cans sufficient time in the baths is as follows:

1. Place cans from sulphuric acid into cold water.
2. " " " one copperas bath into sulphuric acid.
3. " " " floor into copperas bath.
4. " " " hydrochloric acid into flux tank.
5. " " " cold water into hydrochloric acid.
6. Place cans from sulphuric acid into cold water.
7. " " " other copperas bath into sulphuric acid.
8. " " " floor into copperas bath.
9. " " " hydrochloric acid into flux tank.
10. " " " cold water into hydrochloric acid.

This completes the entire cycle and takes twenty minutes when handling small cans and 16 minutes when handling large cans. The underlying purpose of this routine is to utilize the etching equipment to its fullest capacity by filling a tank as soon as it is emptied and to insure sufficient time in the baths for proper etching.

TINNING

When the operation of rubbing the can with powdered ammonium chloride was eliminated it was found that one tinner could take care of all the cans that were pickled for rough tinning, one tinner was required for the finish tinning and sweating operations, and one man for inspecting and cleaning. Thus two picklers and three men in the tinning room turned out twice as many cans as were previously turned out with defectives reduced to a minimum.

Lustre on Tin

Q.—We are having considerable difficulty in our tinning department securing a lasting lustre to our tinned products. Our material goes through the following process: First, our products are placed in a pickling vat containing a solution of approximately 92% Sulphuric acid and 8% water. After remaining in the pickling vat for about one hour or so, it is then placed into a vat containing pure straits tin. It is then given a palm or ruby bath. When the article is first taken out of the tin it has a bright lustre, but immediately upon drying and cooling it loses its bright lustre and changes to a dull gray finish.

For your information we might mention that our vat containing the straits tin also contains about 3% lead. I am also enclosing you a sample of the steel which we are using in the manufacture of our tinned products.

Please investigate this matter and see if you can possibly determine the faults in our process which cause our products to lose their bright lustre after cooling when leaving our tinning vat. If possible advise a remedy whereby our tinned goods will have a lasting lustre.

A.—The pickle that is generally used for cleaning articles that are to be tinned consists of one part of sulphuric acid and six parts of water. In speaking of using a solution of approximately 82% sulphuric acid and 8% of water you probably have the amounts of acid and water reversed. In pure acid iron is passive and acid of this strength would probably not pickle rapidly, if at all.

A high degree of heat is usually the cause of an unsatisfactory color on tinned articles. It gives a rough surface and injures the color and lustre.

The finishing kettle should be as small as possible. In a large finishing kettle the tin is renewed less frequently and for this reason is exposed to a melting temperature for a longer period than an equal amount of tin used in a small kettle. The tin held molten in a large kettle for long periods becomes dull in color, hence the small kettle with its more rapid turnover of tin is preferable.

Where the articles to be tinned are very light the kettles must be run at a rather high temperature, but the samples of steel you sent is rather heavy in gauge and could be finished at a very moderate heat. You can obtain pyrometers that will accurately indicate the temperature of your kettles. In fact, electric heat is now being used by some factories and there are automatic thermostats available that will turn off the electric current as soon as the tin in a kettle becomes in danger of being overheated and they will turn it on again as soon as a temperature is reached below which the tin coating is too heavy.—J. L. Jones.

Details of a Plating Installation

A Number of Questions About Layout and Arrangement

Written for The Metal Industry by CHARLES H. PROCTOR, Plating-Chemical Editor

Plating to be in nickel. Pieces to be nickeled—No. 18 B. & S. Brass tubing ½ inch O. D. x 38¾ inches long.

1. What is the greatest depth of tank, A in sketch, that could be used and yet get fairly uniform deposit on upper and lower tubes?

Ans. 16 to 18 inches.

2. Would offsetting the tubes, as shown in Fig. 1, so as to handle the greatest possible number of tubes per foot of depth in solution, give uniform deposit around tubes? If not, insert proper dimensions.

Ans. Yes.

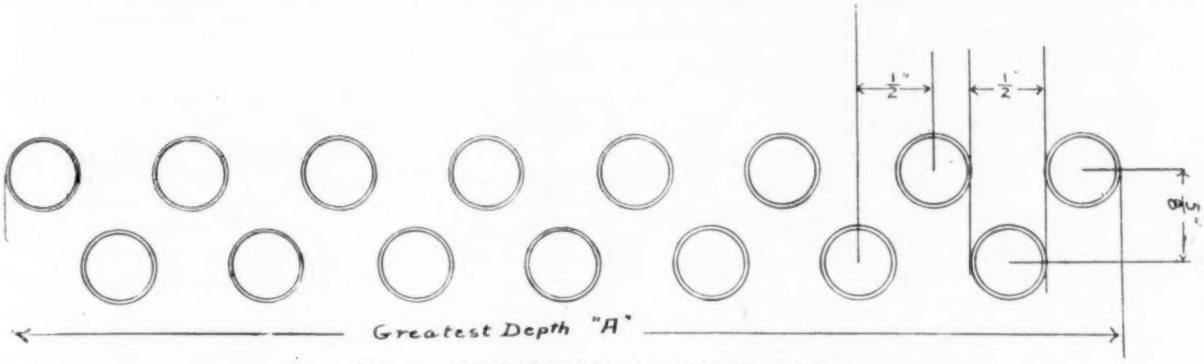


FIG. 1. ARRANGEMENT OF TUBES IN A TANK

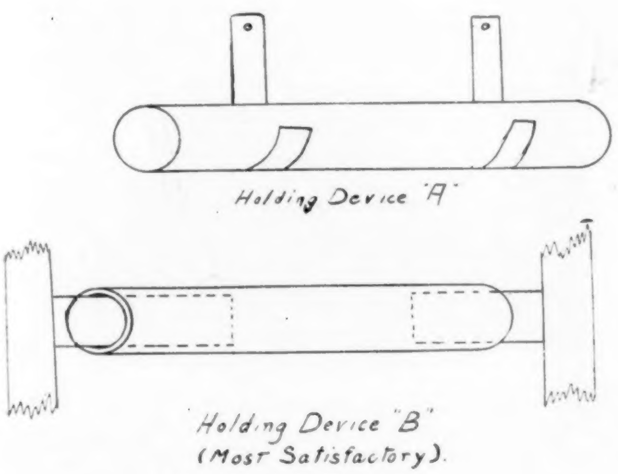


FIG. 2. HOLDING DEVICE

3. According to text books, it is necessary, in calculating proper amperage, to include total area of work, i. e., inside and outside. Is it not true that such a rule would fail in the case of long tubes, insofar as the column of solution within the tube could not carry such a current as would equal amperage per unit area times area, inside? If so, what reduction should be made? Or, give electrical resistance of standard nickel solution.

In calculating such area, would it not be necessary to include that of the holding device? Or, at least, such areas as are exposed to solution.

Ans. Calculate all surface upon which nickel is deposited. Nickel would not deposit inside tube.

4. What amperage per foot would you recommend for this work?

Ans. 10 to 15 amperes per square foot.

5. As regards holding work in solution, would hooks, as indicated in Fig. 2, below, be satisfactory? Would they spot the work at point of contact?

Ans. Yes, the hooks would spot the work.

6. Would device indicated at "B" below, be more satisfactory?

Ans. "B" would be more satisfactory.

7. These tubes will have a fine thread, ½-30, for a distance of 5/16" on both sides. Would it be feasible to plate, then thread, and then color these tubes?

Ans. Yes.

8. Is plating hard on dies and tools, and does threading after plating tend to peel or curl up the plating?

Ans. If deposit is perfectly adherent, such results as noted will not occur.

9. Time required, at amperage you recommend for good nickel plate?

Ans. 45 minutes to one hour at 10 to 15 amperes per square foot.

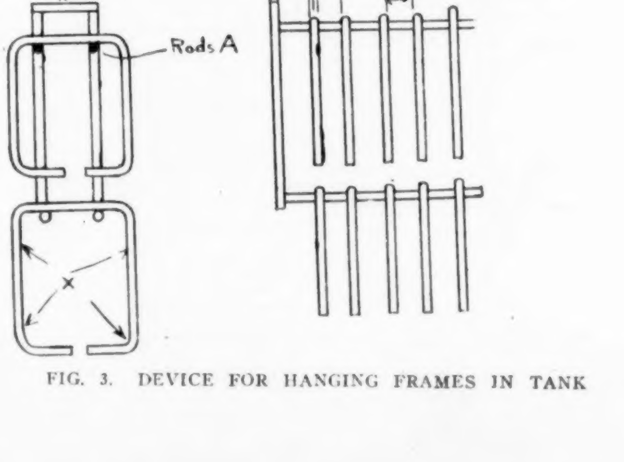


FIG. 3. DEVICE FOR HANGING FRAMES IN TANK

1. Would the rectangles plate properly on the inside, not inside of tube, but inside of rectangle as at X, when properly arranged and spaced as per Fig. 4.

Ans. Yes, if the solution were sufficiently conductive.

2. Would rods A spot the work at points of contact, especially if they are nicked for spacing and contact?

Ans. It is always advisable to change the contact points during intervals of plating.

3. Is the depth of work in solution 26 inches objectionable?

Ans. No, providing the anodes extend 26 inches. At least 12 inches clearance should be allowed at the bottom; 4 to 6 inches at top of solution. Figure tank accordingly.

4. It is objectionable to dry parts in sawdust because sawdust might remain inside and later clog small holes. Would it injure work finish to dry quickly in blast of hot air?

Ans. Hot maple sawdust may be used; hot air blast is better.

5. What amperage per foot and what time is required for this piece to get good nickel plate?

Ans. Depends upon composition of solution. From 5 to 45 amperes; 15 minutes to 1½ hours.

6. Outside area of piece is 0.285 sq. ft.
Inside area of piece is 0.207 sq. ft.
Total area of piece is 0.492 sq. ft.

Would not the total area for purposes of computation be much less than the total area, 0.492 sq. ft?

Ans. Inside area need not be considered, as amperage is only figured on actual area covered.

7. It is desired to handle all this work in the smallest tank which will handle two lengths of the part sketched in Fig. 4, say, a tank closely 48" long. At the same time, or rather in the same tank, it is desired to handle two frames of part on this sheet, side by side as indicated below. By way of determining the narrowest possible tank that would perform this last operation, will you show in the sketch below, the shortest distance from anodes to work (that distance marked X) which would produce good work.

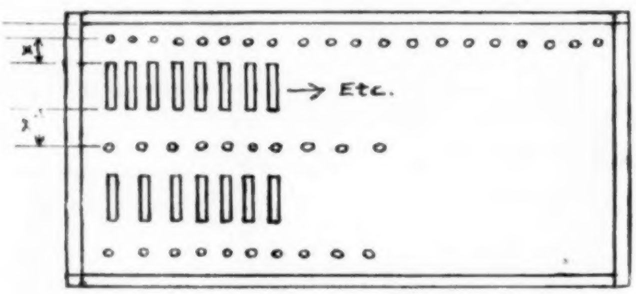


FIG. 4. PLAN VIEW OF TANK ARRANGEMENTS

Ans. As previously outlined tank should have a clearance each end 12 inches below extreme depth of frame used in plating, 6 inches above frames under solution, 4 to 8 inches from work to anodes (x), both sides 8 inches, not less.

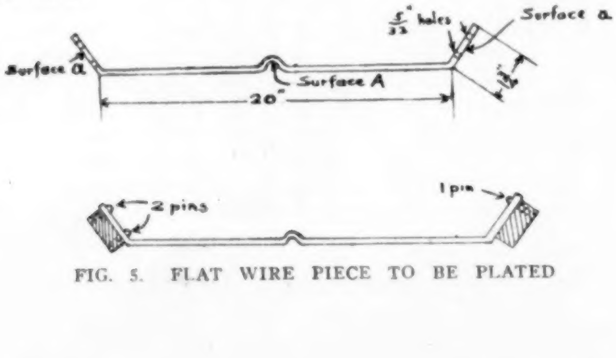


FIG. 5. FLAT WIRE PIECE TO BE PLATED

Plate: nickel.

Material: ⅛" x 9/16" round edge brass flat wire, formed as shown in Fig. 5.

Plating on surfaces "A" is of no importance.

1. Horizontal cross section of work holder, work being sprung into place over pins. Due to inaccuracies of the pieces flat areas would not bear evenly against work frame. Would the effective area, presumably reduced to that of the contact with pins, afford the necessary contact to carry plating current? The vertical spaces between the pieces would be ⅛"

Ans. Yes.

2. What amperage per square foot would you recommend for this work?

Ans. 10 to 15 amperes.*

3. Time required for good nickel plate?

Ans. 45 to 60 minutes.

4. Of what material is it best to construct these frames, copper or high brass?

Ans. Either metal will give good results; copper is more malleable.

5. Would it be advisable to coat unnecessarily exposed portions of such frames with non-platable material, such as japan?

Ans. Frames would naturally last longer if all exposed parts were properly insulated, except points of contact. Bakelite varnish, vulcanized rubber, etc., are superior to japan.

*Amperage given is only approximate. With high density solutions 40 to 50 amperes per square foot could be used.

Bronze in the Lincoln Memorial

Above the statue of Lincoln in the new Memorial, in Washington, are six bronze beams. These beams transverse the 144-foot ceiling, end to end. The marble between the bronze beams is held in place by a network of bronze intermediates. The beams total over 45 tons in weight; they are 6 feet, 2½ inches in breadth and have a depth of 2 feet. Their exposed surface is about 8,600 square feet.

THE LINCOLN MEMORIAL

Plating Stainless Steel

Q.—Can stainless steel, such as made by the several steel companies licensed under the Stainless Steel Company's patents, be electro-plated?

A.—Stainless steel should be as readily plated in any of the commercial metals soluble in cyanides, following the usual procedure of preparing the surface, followed by the usual alkaline cleansing, etc., as other metals.

We are not just sure about plating the metal in the acid types of solution, but any difficulty that might develop due to local action of the solutions upon the steel, may be overcome by plating the surface lightly in an alkaline solution first. C. H. PROCTOR.

THE METAL INDUSTRY

With Which Are Incorporated

THE ALUMINUM WORLD, COPPER and BRASS, THE BRASS FOUNDER and FINISHER, THE ELECTRO-PLATERS' REVIEW

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EDITORIAL

THE NATION'S INCOME

In a very interesting bulletin sent out by the National Bureau of Economic Research, the income of the Nation is tabulated from 1910 to 1919 inclusive. Omitting overall figures which run into billions and are of comparatively little value in getting standards, we find that the income per capita arose from $340 in 1910 to $629 in 1919. This does not mean, however, that the wealth of the country grew in proportion, since this $629 in 1919 was worth only as much as $358 would have been in 1913, due to increased prices. This means for a family of five the average income in 1919 was about $3,000.

The division of the total income of the country, however, shows that every family of 5 did not receive $3,000. It is stated that in 1918 one per cent of the income receivers obtained 14 per cent of all the income, five per cent obtained 26 per cent of the income, ten per cent got 35 per cent of the income and twenty per cent had 47 per cent of the income. It is interesting to note that the share of the total income which went to the richest five per cent of income receivers was 32 per cent in 1913-15, went up to 34 per cent in 1916 and dropped to 24 per cent in 1919. From this the Bureau concludes that "the net effect of our participation in the war was to diminish somewhat (at least temporarily) the inequality in the distribution of American incomes."

Another interesting table shows the division between capital and labor of the products of large organized industries. In 1910, 31 per cent went to investors and management leaving 69 per cent for wages and salaries. This changed to 26 per cent and 74 per cent in 1914. It changed to 33 per cent and 67 per cent in 1916 and changed again to 23 per cent and 77 per cent in 1918. The Bureau states that this appears to indicate "that the shares vary materially with periods of prosperity and depression and bears out the general indication that our participation in the war was accompanied by a lessening of inequality of distribution." The Bureau intends to maintain its work on a continuing basis and to publish the results for the succeeding years as the facts become available.

The sources from which income is drawn are mainly agriculture which contributed 17 per cent, manufacturing, 30 per cent; transportation, 9 per cent; mining, 3 per cent banking, 1 per cent and government 5 per cent. A large group of miscellaneous, such as merchants, retailers, professional men, domestics and other forms of service too numerous to mention contributed about 33 per cent. It is evident, therefore, that manufacturing and farming are the large contributors to the Nation's income.

SALVAGE

At the annual meeting of the American Society of Mechanical Engineers in a symposium on eliminating waste from industry, one of the important factors of the elimination of waste was acknowledged to be salvage of materials which had previously been thrown away. It was stated that the country at large, in a single year, saved scrap of all sorts to a total of more than $1,500,000,000. In Europe the business of salvage and reclamation has grown to a point previously unheard of, due to the large amount of scrap metal on the battle fields. In this country we are realizing more and more that reclamation is a real problem and a real industry; that the junk dealer is no longer a mere junk dealer, but an aid in preventing loss. He has grown to be not only a collector of junk, but a manufacturer of brass, composition, solder, babbitt and various metals.

From its beginnings this industry has carried over practices which are not tolerated in other fields. Customs and traditions, or rather lack of traditions, are hard to overcome, but the industry is building up standards. The metal reclamation industry has grown so large that it is now on a par with many others of long standing and perhaps more dignified history. Much still remains to be done, but improvement is going on.

METAL MERGER COMPLETED

The purchase of a controlling interest in the American Brass Company by the Anaconda Company, which was contingent upon the offer of 51 per cent of the stock, has been completed. The management of the American Brass Company will not change, this point having been stipulated in the terms of the deal.

We have already expressed our opinion on the merger in our issues for December and January. As our last word we can only say that the power in the metal business which will result from this combination has been placed in excellent hands.

PROPRIETARY ALLOYS

The metal trades have long been buried under a flood of alloys, named, not after their constituents or uses, but after the inventors or things of their choice. Almost every day we are requested to give the name of a manufacturer of one alloy or another of which we have not even heard. We have always deplored the tendency to give alloys names which have no relation to their constitutents, properties or uses. However, we take conditions as we find them.

So much we can do for manufacturers of these alloys. If they will inform us of any special mixtures which they make, we will keep them on file in case of inquiries for them. We are very anxious to know all the commercial mixtures on the market. Unfortunately, they come and go in too large numbers and often too silently for us to be aware of them. However, if manufacturers will cooperate with us by sending in the names and uses of these mixtures, we shall be glad to use them for reference.

THE PLATERS' CONSTITUTION

The American Electro Platers Society has appointed a committee consisting of the past presidents of the Supreme Society to re-write the Constitution. This is in no sense an intimation that the old Constitution was poor, but simply that the society has outgrown it, and that the time has come when it is necessary to make changes. The committee of past presidents, than which none better could have been chosen, will undoubtedly make the Constitution of a broad, permanent character. By-laws and temporary regulations can be made and unmade easily, but a Constitution should stand without more than minor changes for some time to come. It will be necessary for the committee to be far sighted, unselfish and in many ways generous. There should be no dickering and no bargaining between branches.

Local interests should be eliminated completely. The only consideration is the good of the Society as a whole, and in considering this principle, a view should be taken not merely for today and tomorrow, but years to come.

CORRESPONDENCE AND DISCUSSION

Although we cordially invite criticisms and expressions of opinion in these columns, THE METAL INDUSTRY assumes no responsibility for statements made therein.

The Electric Brass Melting Furnace Situation

A Summary of the Writer's Conclusions on This Subject

To the Editor of THE METAL INDUSTRY:

Practical metal melters, after ploughing through much electric brass melting furnace literature, must feel as did the immortal Persian poet when he wrote—

"Myself when young did eagerly frequent
Doctor and Saint, and heard great argument
About it and about, but evermore
Came out by the same door where in I went."

It is unfortunate that conditions are such that the average foundryman and metal melter seems to have no impartial unbiassed court of appeal to which he can turn for judgment on his problem. With what satisfaction would such a man turn to such a court and say "Here is my condition—I do not altogether feel satisfied with the results I am getting. What improvements are possible and what do you recommend me to do?" In many cases, no doubt, the answer would be to the effect that all was as it should be and that the results obtained were very satisfactory. Instead of this ideal arrangement, the metal melter is entangled in a maze of words and phrases of sales talk regarding the alleged merits of various forms of apparatus.

For the information and enlightenment of those who may have found it difficult to form an opinion regarding the claims made for electric melting, the following notes are offered in the hope that they may be serviceable.

It may be regarded as a proved fact that there is no such thing as a "best fuel" or "best furnace" for melting brass. The best combination of fuel and furnace can only be determined after a study of local conditions and the metallurgical requirements. The "best fuel" may be coal, coke, gas, oil or electricity and the "best furnace" may be some form of crucible furnace or some type of reverberatory furnace.

It is absurd to attempt to compare "electric furnaces" with "coal furnaces," etc.; such comparisons are very common and have resulted in much confusion and misapprehension. To compare an "electric furnace" with a "coal furnace" is, in reality, the comparison of two entirely different types of apparatus and attributing the difference in them to the fuel. An electric furnace may or may not be satisfactory under a given set of conditions, but if it should be, it is not because it is "electric." It is because the design of the furnace, the design and type of the mechanical equipment, the capacity of the furnace, the type and price of the fuel, etc., all suit the local conditions.

In some shops, some types of electric furnaces have shown improvement over other older types of melting equipment. How much of this is due to the fact that the shop practice with the older type of equipment was very bad whereas the introduction of the electric equipment resulted in close study of the situation and better supervision and methods, is hard to say. Certain it is that there are many shops using fuel fired equipment where the introduction of electric equipment together with more scientific control and better metallurgical practice would result in improvement. The point to be observed, however, is the fact that any improvement effected might be due to the better management of the shop, improved methods, careful cost keeping, etc., rather than to the furnace equipment.

To this extent, we are somewhat indebted to the electric furnace promoters in that they have contributed in causing closer study of melting practice.

In the opinion of the writer, there is little doubt but that a careful study of existing conditions in many shops by an experienced metallurgist and furnace engineer, will reveal unsuspected possibilities and ways and means of effecting improvements and economies. And it is also extremely probable that existing equipment will be found so satisfactory that any change in it would not show sufficient saving to be justified.

Crucible practice with melting equipment suitable to the conditions is the most economical in the long run and best from a quality standpoint, in the majority of cases; so much so that metal melters should insist on a careful study by unbiassed, competent observers and engineers before any decision is made to change the methods of melting.

It is claimed for electrical equipment that better metal is obtained, also that zinc loss is greatly reduced and that so-called "unskilled" labor may be used. The first of these claims is so ambiguous and indefinite that it is difficult to controvert. Defective metal and castings can be produced with an electric or any other kind of a furnace; it is a matter of manipulation and casting practice. It is certainly impossible to produce any better metal than is produced in crucibles and neither is it any more difficult to produce it in crucibles than with any other method. Zinc loss is also a matter of manipulation and melting practice, affected to some extent by the furnace design. Low zinc loss is not an inherent feature of electric melting. The third claim, that so-called "unskilled" labor may be used, is so manifestly without foundation that it is unlikely to receive any consideration from practical foundrymen.

In this connection, foundrymen and metal melters will be greatly interested in the experience of Mr. N. K. B. Patch, of the Lumen Bearing Co., Buffalo, N. Y., with electric brass melting furnaces, contained in a paper read before the American Society of Electrochemical Engineers and reported in THE METAL INDUSTRY, November, 1921.

It is doubtful if the operations of the brass foundry or brass rolling mill industry can ever be standardized to any great extent. Certainly never to the extent that the iron foundry or steel mill industry is. New alloys and a demand for the great variety of the present alloys will always exist and therefore the melting equipment must be as flexible as possible. No method of melting has a great flexibility as crucible practice and the equipment required possesses the all important virtue of low initial cost, so that any sudden growth in business can be taken care of at small cost, and conversely, in dull times the interest and overhead on idle plant capacity is very low. It is just in such considerations as this that lie one great disadvantage of electric equipment. The initial cost is very high, so that interest, depreciation and carrying charges become burdensome, and furthermore, it must not be overlooked that power contracts must be signed which oblige the purchaser to take a minimum quantity of power per year which must be paid for whether used or not. This becomes very embarrassing in slack periods. There are also many other points about buying large quantities of electrical power that are likely sources of serious trouble, as any purchaser of power will confirm.

The watch word on this whole situation in its present day status may well be said to be "Safety First."

THOS. H. A. EASTICK.

Montreal, Canada, January 7, 1922.

THE BRASS TRADE

To the Editor of THE METAL INDUSTRY:

I read Mr. Krom's article and it struck me that his size-up of the situation is an intelligent one. What has already happened is only in line with what might reasonably have been expected,

and further development along this same line is hardly more than natural, in view of after-war conditions that have developed.

THE MICHIGAN COPPER AND BRASS COMPANY,
A. B. SEELIG.

Detroit, Mich., January 31, 1922.

To the Editor of THE METAL INDUSTRY:

Referring to the opinion expressed by Mr. L. J. Krom entitled "Signs of the Times in the Brass Trade," which appeared in your January issue. The article was read with interest.

Mr. Krom states that he "looks for a combination of other interests—perhaps some of the Waterbury Mills combining with Rome and Detroit." I do not, of course, know what prompted Mr. Krom's opinion in the above direction, unless he has information of which the interested parties know nothing about.

The purchase of the American Brass Company by the Anaconda Mining Company has prompted numerous concerns, whose business is to promote consolidations, etc., to become quite active and this activity has resulted in rumors which, if run-down, would fail to disclose any foundation. Again, there may be cases where the thought of a consolidation is simply the father to a wish.

DETROIT COPPER & BRASS ROLLING MILLS.
FRANK H. HOFFMAN.

Detroit, Mich., January 31, 1922.

CORRECTION

To the Editor of THE METAL INDUSTRY:

I note on page 37 of THE METAL INDUSTRY for January, 1922, a statement that I have been elected chairman of the Division on Electrodeposition of the American Electrochemical Society. As a matter of fact, there has not been any meeting of this new division, and therefore no opportunity for the election of any permanent officers. I am simply serving as chairman of an organizing committee, consisting of Messrs. G. B. Hobaboom, H. S. Lukens, and myself.

I do not consider the error of sufficient importance to warrant a printed correction, but simply call your attention to it as it is misleading and may cause misunderstanding on the part of some members of the division.

Washington, D. C., January 25, 1922.

W. BLUM.

PLASTIC ALLOYS

To the Editor of THE METAL INDUSTRY:

In the November number of your publication, I noted some reference to the plastic alloy, 65 Cu, 5 Sn, 35 lead. Those interested manifested a desire for a successful procedure to make this alloy so as to produce better physical properties such as ultimate strength, elongation, etc., than this alloy now gives with the best practice using the virgin metals stated.

If the price is no object, the procedure is as follows: Melt down, good and hot, under a cover of charcoal, 60 pounds of commercial copper. Then add to this melt, 5 pounds of a 30 per cent. manganese copper. Stir this well, then gradually add the lead and tin which has previously been alloyed together and poured into small pigs or otherwise manipulated for easy handling, stirring after each application. When the pot is lifted skim off the old charcoal and add another fresh cover, and when about to pour either skim off or hold back the charcoal. If the job is a worthy one, take an extra precaution and use skim gates. Under these conditions, this alloy has given a tensile strength of over 25,000 lbs., an elongation of 15 per cent and a compression under a 100,000 lbs. of 0.35. Manganese is in itself, a good vehicle to prevent lead sweats and segregation, either for 50 copper and 50 lead or otherwise and gives a strong, tough, close and tenacious alloy. A 30-70 manganese copper in 5 pounds gives a manganese content of 1½ per cent.

If you are in the "game" for a cheap product, and desire to save time, make a hardener of one-half tin and one-half antimony and use this for either a 5 or 10 per cent alloy plus copper and lead to make up the difference for 100 parts. This makes an alloy that is equal to, if not better, for bearings than all tin in the mix of 5 or 10 per cent., and anyone who can melt copper can handle this and make a superior alloy free from lead sweat and segregation.

EDWARD D. GLEASON.

Bayonne, N. J., January 15, 1921.

NEW BOOKS

Hardware Buyers' Directory, published by Hardware Age, New York. Size 7 x 10, 721 pages. Price $5.00, payable in advance. For sale by THE METAL INDUSTRY.

This work, the first of its kind, it is stated, has been compiled with the utmost care by *Hardware Age* for buyers in the hardware trade. The heads are classified so that addresses of manufacturers can be found under the articles which the reader may desire to investigate or purchase. It includes manufacturers of hardware of every description from buttons to wrenches. The point of particular interest to metal manufacturers is the fact that most of these hardware manufacturers are makers of metal products or of products which include metal in one form or another. This makes the volume valuable, not only to purchasers of hardware, but manufacturers of metal who wish to find an outlet for their product. The book is of convenient size, comfortable to handle, and so arranged as to make reference very easy. It is a valuable volume.

The Manufacture of Aluminum, by J. T. Pattison, published by E. & F. N. Spon, Ltd., London. Sizes 5 x 7½, 104 pages. Price $2.25, payable in advance. For sale by THE METAL INDUSTRY.

For a metal that has grown to such tremendous importance there is a very slight literature on aluminum in bound form. An enormous amount of material has, of course, been published by periodicals and by scientific societies, but nothing comprehensive has appeared since the late Dr. Richards' work.

This book of Mr. Pattison's does not attempt to be comprehensive but it is a very interesting and worth while start in the direction of a literature on aluminum. It includes a historical survey of processes, the occurrence of aluminum, the manufacture of carbon electrodes, the manufacture of pure alumina, the founding of aluminum, alloys of aluminum, uses and applications and the analysis and examination of aluminum works materials. The book goes into no exhaustive detail on any one of these topics, but aims rather to give a perspective view. On some points, however, the author is very precise. It is evident that he is essentially a chemist and his chapter on the analysis and examination of materials seems to be excellent.

One wishes, on reading this little volume, that a really all-inclusive work would be written. However, this book is useful and interesting, both from a point of view of the chemist or metallurgist and from the worker of aluminum who wishes to get a broader view and a better understanding of his medium.

The Metallurgy of Zinc and Cadmium, by Hofman, published by McGraw-Hill Book Company, New York. Size 6 x 9, 341 pages. Price $4.00, payable in advance. For sale by THE METAL INDUSTRY.

This is the fourth book of a series being written by Dr. Hofman. To praise this work is unnecessary since Dr. Hofman's previous works have made further praise out of place. The book is complete, authoritative and scholarly. It covers zinc and cadmium from every angle from the mine to the finished product, chemical or metal.

Its value is enhanced by the fact that it covers so completely the foreign methods of abstracting zinc which are so important, and about which it has always been so difficult to obtain accurate information. There are excellent chapters on the Industrial Uses, Alloys and Compounds of Zinc which bring the book close to the metallurgist's and manufacturer's interest in zinc from the standpoint of its industrial uses and forms. Not only that, but its completeness in covering the whole subject of zinc make it a necessity for every metallurgist, whether he is directly concerned with zinc smelting or not.

Cadmium is treated in as great detail as zinc. Chapters of unusual interest are Properties of Cadmium, Cadmium of Commerce, Its Mixtures and Their Effects, Industrial Uses and Alloys and Cadmium Compounds. No library can afford to be without this work.

SHOP PROBLEMS

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE

ALUMINUM IN TIN BRONZE

Q.—We are sending you two pieces of bronze metal, both of the same formula and consisting of approximately 90% copper, 7% tin, 2% spelter, 1% lead, with a small percentage of phosphorus, introduced in the form of phosphor copper. These castings have been acid dipped, and we would like to know what causes the lead color on the surface of one of these pieces. This metal is made of all new metals with the exception of a small percentage of heavy trolley wire, the balance of the copper being electrolytic ingot. Some heats will come out nice and clean as shown by the one piece enclosed while in the case of other heats, a greater part of the castings may show up like the dark or lead colored one. In the majority of cases, the heavier end of the casting nearest the sprue will have the proper rich bronze color, while the other lighter end will be dark. In other instances, only a few castings nearest the pouring sprue will be discolored and frequently the first molds of a heat will show the discoloration while the balance of the heat will be perfectly clean and bright. A greater part of this discoloration is removed by frequent dipping, but sometimes it may require fifteen to twenty dips to remove it. We have tried pickling in the hydrofluoric acid dip, leaving some remain anywhere from two days to a week for experimental purposes and afterwards dipping them in the usual bright dip of nitric and sulphuric acid, but even this does not always remove it. When using the same metals day after day, some heats will be perfectly clean, others very black, while other heats will show some castings discolored entirely or only in part. The worst discoloration seem to come from the first metal poured from the pot, showing that whatever causes this discoloration is evidently the lightest.

A.—There is nothing in the mixture that you give that could possibly do such to a mixture as to cause such a color. The sample submitted cannot possibly be of the same composition if both have been acid dipped, for one sample has all the appearances of having aluminum in the metal. I would suggest you to look after the spelter you are using as very often re-run spelter is fluxed by aluminum to give it a nice appearance. It would take very little aluminum in a high tin bronze, such as your mixture calls for, to cause this discoloring. At any rate there is some foreign substance in your metal which causes this discoloration and it has the appearance of aluminum. I would suggest that you have analysis made of the heats that give you this trouble, and you will find the cause, as the mixture given cannot possibly have any characteristics such as you state.—W. J. R. Problem 3,033.

BINDER FOR TRIPOLI

Q.—How can raw tripoli be made into tripoli brick (buffing composition)? What is the binder?

A.—In preparing tripoli for polishing in cakes or bricks, stearic acid is the binder. However, paraffine wax is usually incorporated with it to lower the cost.

Mutton tallow is the lubricating medium, but an excess of this material must be avoided or the tripoli will be too greasy and soft.—C. H. P. Problem 3,034.

CRYSTALLIZED SILVER SOLUTION

Q.—I have a silver solution with 4 ounces of sodium cyanide and about ½ ounce of silver per gallon of water, in which crystals have formed. What are they and how can I get rid of them?

A.—A silver solution made up from 4 ounces of sodium cyanide and only one-half ounce of metallic silver per gallon of water will not crystallize out at normal temperature.

If the silver was cut down with nitric acid and the silver nitrated was taken up directly without the usual conversion to silver chloride or silver cyanide, the crystals may be sodium nitrate crystals.

In any event they contain no silver. If the solution is exposed to a very low temperature, the crystals will form more readily. Remove them by passing the solution through two or three thicknesses of cheese cloth and then throw them away.

Leave your windows open any good cold day and night near your silver tank, and the crystals will form rapidly whether they are sodium nitrate or sodium carbonate crystals. C. H. P. Problem 3,035.

COINAGE METALS

Q.—What is the percentage of various metals in American coins of $1 and less?

A.—The appended diagram gives the full information you seek:

		COMPOSITION				
Coin	Legal Weight, Troy Ozs.	Silver	Copper	Nickel	Tin	Zinc
Dollar	.859375	900	100			
Half-Dollar	.401875	900	100			
Quarter-Dollar ..	.200937	900	100			
Dime	.080375	900	100			
5-cent piece	.16075		75	25		
1-cent piece	.10000		95		1	4

H .D. C. Problem 3,036.

DARK GREEN GOLD

Q.—How can I get a dark green gold using arsenic instead of cyanide?

A.—The Dark Green Gold Solution given on page 16 of Platers' Wrinkles, under Dark Green Gold (smut) can be used as the basic formula. The lead cyanide given in the formula may be replaced with sodium arsenite to produce the dark smut.

Water	1	gallon
Gold Chloride	1-3	ounce
Silver Chloride	1-12	"
Cyanide of Lead	1-13	"
Sodium Cyanide	5-6	"

Temperature 80 to 100 deg. Fahr., at 3 to 4 volts. Anodes 14 karat green gold or platinum.

Sodium arsenite can be prepared by dissolving powdered white arsenic in caustic soda dissolved in water; 1 part arsenic to ½ part caustic soda. In this form it may be used in any type of green gold solution, such as given in Platers' Wrinkles under the heading of Dark Green Gold (smut). C. H. P. Problem 3,037.

FLUX FOR LEAD COATING

Q.—What is a good flux for coating sheet steel with molten lead? We are using zinc chloride but it is not very good.

A.—The regular chloride of zinc tinning flux is of little advantage in coating sheet steel with molten lead. The most satisfactory flux for coating steel with lead is to coat the steel with a film of mercury.

There has been a patent recently granted for coating steel with lead. The method covers the deposition of an electro-deposited coat of mercury. Evidently the patent authorities never read THE METAL INDUSTRY, or such a patent would never have been granted.

It is possible that you can coat the steel parts with a film of mercury by immersing them in a solution composed as follows:

Water	1	gallon
Ammonium Chloride	1½	pounds
Bichloride of Mercury	2	ounces

If you have a plating department you could arrange the so-

lution as a plating solution. Carbon or steel could be used as the anodes. Mercury deposits very readily at 2 to 4 volts.

You could also try the following solution as an electro mercury solution:

Water	1 gallon
Sodium Cyanide	4 ounces
Bichloride of Mercury	1 "
Caustic Soda	1 "

As soon as you have coated the steel with a film of mercury, immerse the articles after washing in water, in a strong solution of sal ammoniac, then into the lead bath.

Tallow is an excellen flux in lead burning. It might be possible to obtain better results by immersing the articles in molten tallow after you have coated the steel with a film of mercury, and then direct in the molten lead bath. C. H. P. Problem 3,038.

NICKEL FLASH FOR WHITE GOLD

Q.—What is the formula for a good nickel solution for a flash for white gold?

A.—A nickel solution to be used as a flash for white gold should be dilute and warm. Try the following solutions:

No. 1		No. 2	
Water	1 gallon	Water	1 gallon
Single Nickel Salts	3 ozs.	Single Nickel Salts	3 1/3 ozs.
Boracic Acid	1/3 oz.	Nickel Fluoride	½ oz.
Common Salt	¼ "	Boracic Acid	½ "
Epsom Salts	1/3 "	Epsom Salts	1/3 "

A very little citric acid added to No. 1 gives whiter deposits; ⅛-ounce per gallon. C. H. P. Problem 3,039.

OXIDIZING SILVER

Q.—What is a good oxidizer for silver rings?

A.—For oxidizing silver rings you can use polysulphide. In eight ounces of hot water dissolve 1 ounce of polysulphide, then add about 10 drops of strong ammonia. To apply heat up the ring to the temperature of boiling water and apply a little of the polysulphide with a brush. The silver will turn black in a moment. Wash in water and relieve with pumice stone and water.—C. H. P. Problem 3,040.

SMUTTY BRASS DEPOSIT

Q.—I am bright brass plating hardware. On the lower edges of curved piece hanging at the bottom of the racks, a black smut forms. Heating the solution and agitating the solution help, but they take too much time. I use a little arsenic (1 lb. to 1,000 gallons of solution) dissolved in caustic soda, as a brightener. Does this cause the trouble?

A.—We should infer that your brass solution is somewhat deficient in copper. The smutty tone would indicate an excess of zinc.

It is possible that an addition of bisulphite of soda might overcome your trouble, with a slight increase of sodium cyanide. Try adding 1 ounce of bisulphite of soda and 1 ounce of sodium cyanide per gallon of solution.

If the brass color shows a faint reddish tone, add some ammonium chloride to even up the color; ⅓ to ½ ounces per gallon will be ample. Your brass anodes should extend at least to the bottom of your plating racks. If they extended three inches below, it would be an advantage in giving a more uniform deposit. You have not apparently used an excess of arsenic. C. H. P. Problem 3,041.

STOVE BLACKING

Q.—What is a formula for a lustrous, heat-resisting stove blacking?

A.—Any graphite stove polish properly applied to iron stove parts will withstand the heat of several hundred degrees, but it takes considerable manual labor in brushing operations to give a lustre to the graphite so applied. For your purpose, and to avoid an excess of manual labor, the following formula should be used. It can be applied by a brush, and will dry to a good lustre, and will withstand considerable heat.

Graphite, finely powdered	1 pound
Lamp Black, finely powdered	1 ounce
Powdered Rosin	4 ounces
Turpentine	1 gallon

Dissolve the rosin in a small amount of turpentine by the aid of heat, before mixing all the ingredients together.—C. H. P. Problem 3,042.

TIFFANY GREEN

Q.—How can I produce a Tiffany Green on lamps?

A.—To produce a Tiffany Green upon a lamp, it is advisable to copperplate the surface and then oxidize it to a blue black with liver of sulphur or polysulphide solution, using ½ ounce of either material to 1 gallon of warm water. After oxidizing, the following Tiffany Green solution should be applied with a brush, giving a stippling motion to the brush:

Water	1 gallon
Sulphate of Copper	8 ounces
Sal Ammoniac	4 "
Common Salt	8 "
Chloride of Zinc	1 "
Acetic Acid 28%	2 "
Glycerine	1 "

Any amount of solution may be prepared following the above proportions. If the first coat does not give a sufficiently dense green, apply a second coat. When the lamp becomes dry apply a coat of lacquer or a thin beeswax in turpentine. Then rub down with a canton flannel cloth. C. H. P. Problem 3,043.

TURBINE BLADE ALLOYS

Q.—What is the composition of alloys for high pressure and superheated steam turbine blading?

A.—One large producer of this class of work specified Monel metal as the composition used for such work. From rolled or drawn stock Monel metal is in all probability the best alloy for this work. It is strong, and non-corrosive. It is used by most of the valve manufacturers for superheated steam work, valve seats, etc., and is said to give the best results. It contains approximately 60% nickel. This metal is obtained in the Sudbury district of Canada. The ore is refined to a composition of approximately copper 36, nickel 60, and iron 4. Monel metal is a comparatively new alloy and is manufactured by the International Nickel Company of Bayonne, N. J.

Other metals used for this work are manganese bronze, tobin bronze and rolled phosphor bronze. The composition of these alloys is given as follows:

MANGANESE BRONZE:		ROLLED PHOSPHOR BRONZE:	
Copper	56.0	Copper	95
Zinc	41.0	Phos. Tin	5
Iron	1.0	TOBIN BRONZE:	
Mang	0.5	Copper	60 to 62
Tin	0.5	Zinc	38 to 40
Aluminum	1.0	Iron	trace

In some types of turbine blading, copper clad iron is used. This material is cast with copper, being cast around the iron, and then drawn into shape. It is said to give excellent results. In general, extruded metal or rolled shapes are used but castings are often used according to the design and most of them in manganese bronze.—W. J. R. Problem 3,044.

WHITE GOLD

Q.—Kindly let me have some formulae for 14 and 18 k. white gold.

A.—The majority of white gold alloys that are of commercial value are patented. We would suggest that you send to the Government Printing Office, Washington, D. C., for copies of patents No. 1,330,231, February 10, 1920, Production of White Gold, also No. 1,283,264, October 29, 1918. You can obtain copies of the above patents for 10 cents. You can no doubt work out your own alloys from perusing these patents. C. H. P. Problem 3,045.

PATENTS

A REVIEW OF CURRENT PATENTS OF INTEREST

1,396,051. November 8, 1921. **Process of Coating Steel Sheets with Tin.** Samuel Peacock, of Wheeling, W. Va., assignor, by mesne assignments, to Wheeling Steel and Iron Company, of Wheeling, W. Va., a corporation of West Virginia.

The process of forming a coherent coating of tin on thin steel sheets which consists in preparing a solution of stannous chlorid mixed with an alum having an alkaline reaction adapted to restrain the ionic concentration of said stannous chlorid; immersing said sheets in a clean condition in said solution; and subjecting the latter to a steam pressure exceeding two atmospheres, substantially as described.

1,398,507. November 29, 1921. **Method of and Composition for Cleaning Metals.** James H. Gravell, of Elkins Park, Pa.

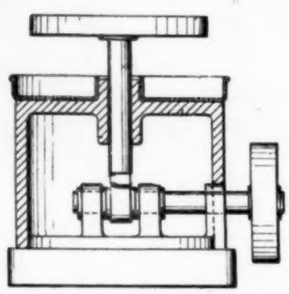
This invention relates generally to cleaning metals and particularly to cleaning iron and steel, preparatory to painting.

The principal objects of the invention are, first, to provide a method and an admixture or composition for cleaning steel which will be effective even when the metal is both oily and rusty; and second, to hasten the cleaning action of an acid in cases where the rust on the surface of the metal is excessive or where the surface is unduly oily.

1,399,679. December 6, 1921. **Method of Converting Scrap Metals Into Merchant Bars.** John T. Wenyon, of Harrisburg, Pa.

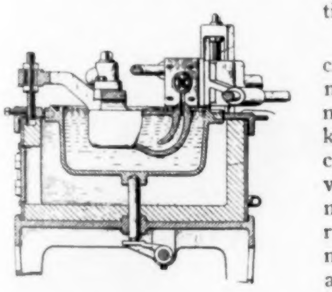
The object of the invention is to provide economical improvements in the carrying out or manipulation of the manufacturing process of box piling and of wrought iron and steel scrap by amalgamating therewith sufficient molten metal, of any suitable ingredient to procure a perfectly homogeneous weld of the scrap material.

1,397,175. November 15, 1921. **Art of Metal-Coating Metallic Articles.** Edward S. Mowry, of Middletown, Conn.



This invention relates to the are of applying a metallic coating or finish to metallic articles, especially of the smaller sorts, and an object of this invention, among others, is to provide a method for treating such articles that will produce an even coating of the material on the articles and an extremely smooth finish therefor.

1,398,314. November 29, 1921. **Die-Casting Machine.** George Waldemar Bungay, of Brooklyn, N. Y., assignor to Acme Die Casting Corporation.

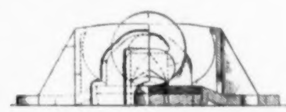


This invention relates to casting machines for casting metals under pressure, such machines being commonly known as die casting machines. Objects of this invention are to produce such a machine that will do the work rapidly and which can be manipulated by a single operator. Other objects of this invention are to produce a machine which will be durable, effective, safe, reliable, and which will be comparatively inexpensive to manufacture. Other objects and advantages of this invention will hereinafter appear.

1,398,220. November 29, 1921. **Bearing.** Edward Goodrich Acheson, Jr., of Niagara Falls, N. Y.

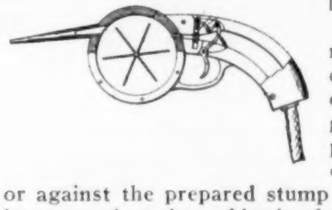
This invention is an improvement in bearings, and relates to bearings of the oilless type, wherein the bearing has incorporated therewith segregated masses of lubricant bearing material, adapted to lubricate the bearing surfaces continuously by contact therewith. An object of the invention is to provide in a bearing of the character specified, means for enabling a pure, unctuous, amorphous graphite to be used as the lubricating agent, without the necessity for an admixture of a bonding material.

1,398,390. November 29, 1921. **Antifriction-Bearing.** Hubert M. Perry, of Chicago, Ill., assignor to Sophie L. Woods, of Chicago, Ill.



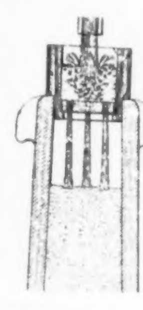
This invention relates to improvements in antifriction bearings designed to transmit load between two members capable of a limited relative oscillating movement, and is shown as herein embodied in a side bearing for railroad cars and more particularly to a side bearing to be attached to the truck bolster of the car as distinguished from one carried by the body bolster of the car. The inventon consists of the matters hereinafter described and more particularly pointed out in the appended claims.

1,398,527. November 29, 1921. **Instrument for Supplying Comminuted Gold by Air-Pressure.** Frederic James Muspratt, of Township of Woombye, Queensland, Australia.



This invention consists of a machine for filling teeth and crown and bridge building by driving particles of gold with great force by means of compressed air into the prepared cavity of the tooth for filling or against the prepared stump of the tooth for crown building or against the gold wire for bridge building.

1,399,798. December 13, 1921. **Apparatus and Method for Casting Metal Products.** Andrew R. Rowe, of Portsmouth, Ohio.



This invention relates to improvements in devices for casting iron and steel ingots and other metal products and the primary object of the invention is to furnish a novel molding device or mold attachment which will eliminate defects now found in molding molten metals.

1,399,769. December 13, 1921. **Soldering-Strip.** Francis Hodgkinson, of Edgewood, Pa., assignor to Westinghouse Electric and Manufacturing Company.

This invention relates to soldering, welding, or brazing strips, and has for an object to produce a strip which will facilitate the most desirable distribution of solder or brazing material in the finished article. A further object is to produce a strip which is especially adapted to be employed in soldering, welding or brazing articles in which it is desirable to have an economic and uniform distribution of material.

EQUIPMENT

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST

SILICON NICKEL SHOT

The addition of small percentages of silicon to nickel shot produces a silicon nickel shot, which is said to be superior in many ways to the case hardened steel balls commonly in use, and to possess none of the disadvantages of the latter.

A new method of polishing and burnishing metals with the tumbling process has recently been developed. Nickel silicon shot is used in this process and has, it is claimed, the following advantages:

(1) Longer Life.

(2) Does not rust or corrode and always remains bright and clean.

(3) May be used in conjunction with acids in which case it removes scale, etc., in half the time than would otherwise be the case. This method of polishing is ruinous to case hardened steel balls, as they are rapidly corroded, become soft in spots and lose their temper.

(4) The polishing water does not become dark and slimy so as to render articles difficult to clean after polishing.

(5) May be used in either wet or dry tumbling process.

(6) Is non-magnetic and can be used in process using magnetic tumbling barrel for iron and steel articles. The use of this process cuts down losses due to breakage.

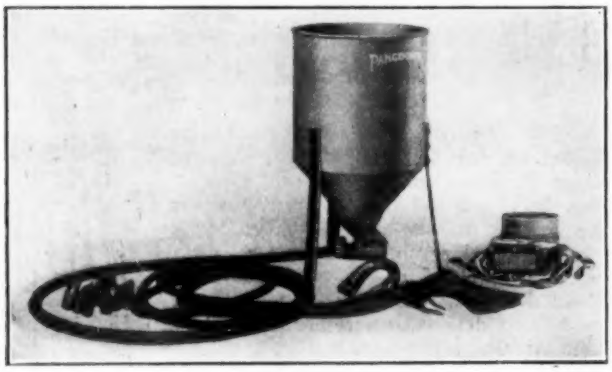
This silicon-nickel shot is manufactured and sold by the International Nickel Company, 67 Wall street, New York.

NEW SAND-BLAST

A thoroughly practical sand-blast, so small that it can be picked up and easily carried, yet does work possible with any sand-blast.

The hose machine consists of a suction type gun, with the blast action controlled by a trigger in the handle. Compressed air passing through the air jet creates a vacuum by which the abrasive (either sand or metallic abrasive) is brought from the hopper to the gun body, which forms a mixing chamber for the air and abrasive where it is given a swirling action, as produced by rifling of a gun barrel, and produces greatest effectiveness for the blast stream.

Quickly interchangeable nozzles make its use possible in plants having the smallest volume of compressed air, or the least work.



PORTABLE SAND-BLAST

It operates at any pressure from as low as 5 lbs. to 100 lbs.

A small cabinet is manufactured that can be set over the hopper of the hose sand-blast and supplies the most economical means of cleaning small parts, furnishing a complete self-contained continuous cabinet sand-blast at a very low initial cost.

These units are made by the Pangborn Corporation, Hagerstown, Md.

NON-CORROSIVE ALLOY

An alloy named Sillman's Apex Bronze is being marketed by H. E. Berliner, 110 Nassau St., New York. It is stated that it has been in use for years for gun mounts and tractors, liners of various kinds, stems for valves, parts of water hydrants and pickling.

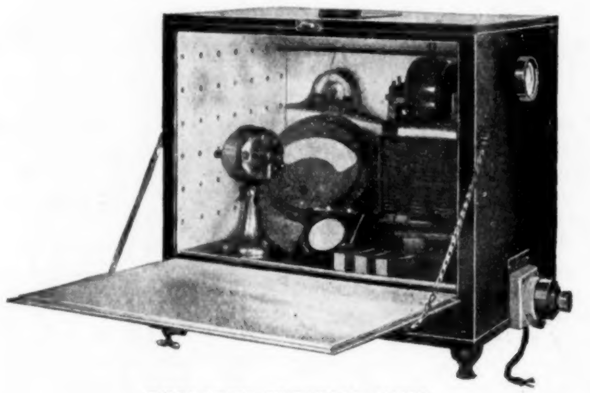
Results of tests are given as to its corrosive qualities, which show a very high resistance to corrosion, even when compared with Monel metal.

It is claimed that some of the users of this Apex bronze have had the most satisfactory results; that one of the users has cast stems as long as 21 feet and 4½ inches in diameter, which proved to be better than Tobin bronze both in tensile strength and elongation; that this same party for several years used this bronze extensively with a tensile strength averaging 90,000 pounds, elongation being 29%.

The mixture is about 86 copper, 10 aluminum and 4 iron. It is claimed that the metal can be cast, rolled, forged, extruded and die-cast, also that gates, borings, etc., can be re-melted several times without the loss of any of the physical properties. The method of melting is the usual one and very similar to that of Manganese bronze; all that is required is plenty of riser.

NEW ELECTRIC OVEN

The Despatch electric oven, manufactured by the Despatch Manufacturing Company, 116 First Avenue North, Minneapolis, Minn., embodies, it is claimed, certain features which make it peculiarly suitable for baking and drying enamel on automobile parts, name plates and accessories. There are ventilating slides, heat control, thermometer and new shelf arrangement. The heating elements consist of open wire companion units so arranged as

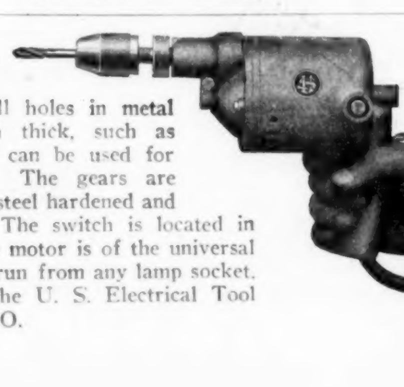


DESPATCH ELECTRIC OVEN

to make the heat distribution uniform. They do not become red, thus lessening the chances of fire.

The oven is made of heavy sheet iron, double walls insulated with high grade asbestos, finished in black enamel on the outside and aluminum on the inside to prevent corrosion. Shelves consist of six rods and six hooks. Ovens are guaranteed for one year against defects in workmanship.

CYCLONE DRILL



This drill is designed for wood boring or for drilling small holes in metal up to 5/16-inch thick, such as name plates. It can be used for cotterpin holes. The gears are made of chrome steel hardened and run in grease. The switch is located in the handle. The motor is of the universal type and can be run from any lamp socket. It is made by the U. S. Electrical Tool Co., Cincinnati, O.

NEW CALCULATING MACHINE

The Monroe Calculating Machine Company, having general offices in the Woolworth building, New York, and plant in Orange, N. J., have just brought out a new model calculating machine to be made up in three sizes, 12 to 20 place capacity. This wide range supplies a machine for every figuring need.

Calculation with speed and practically without effort is made possible by the easy, flexible, crank operation of the New Monroe. The crank is short, smooth running and turns with merely a slight wrist movement.

Every feature of the Monroe is made with an eye to speed with accuracy. The key touch is light and the stroke short; the crank motion is fast and smooth; the key and dial numbers are large, conveniently placed and easily read; mechanical locks eliminate errors. These with the simple, flexible Two-Way mechanism and Visible Proof mean Speed with absolute accuracy.

The New Monroe is made in three sizes, 20 place, 16 place and 12 place. From this range may be selected a machine which will answer any figuring purpose. The perfect calculating and adding machine for any business, large or small. The machine case and the carriage case are aluminum castings handsomely designed and finished with great care, making it a very smart looking machine. The background under the keys is an enameled green which is restful to the eye.

NEW CLEANING MACHINE

The Black & Decker Manufacturing Company, Baltimore, Md., announce the Black & Decker safety cleaning machine, which consists of a cast iron pedestal with a bowl at the top, 13 inches in diameter and about 12 inches deep. About 5 inches from the bottom of the bowl a fine mesh brass screen is supported. A plunger pump is cast integral with the bowl at one side. The bowl is provided with a safety cover, arranged so that it cannot be left open. This cover is controlled by a convenient handle which operates the plunger pump when the cover is lifted.

A gallon of gasoline, kerosene or such liquid cleanser as is desired to use is merely poured into the bowl of the machine and the operation of the plunger pump forces a stream of this fluid from one side into the center of the bowl. It passes through the screen and returns to the pump so that the liquid is used over and over again.

It is merely necessary to hold the part to be cleaned under the stream of cleaning liquid which washes dirt, chips and foreign matter from the part to be cleaned and deposits it on the screen below.

This machine is said to be particularly useful for cleaning ball bearings, roller bearings, gears, magneto, distributor, starting motor and generator parts, and any pieces which can be introduced under the cleansing stream; also for cleaning drills, milling cutters, tools, etc.

This machine bears the approval of the Fire Underwriters, and is designed to do away with the dangerous and wasteful "bucket and brush" method of cleaning.

OPERATING THE CLEANING MACHINE

ASSOCIATIONS AND SOCIETIES

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

AMERICAN FOUNDRYMEN'S ASSOCIATION

HEADQUARTERS, 140 SOUTH DEARBORN ST., CHICAGO, ILL.

Final arrangements have been made for holding the Annual Convention and Exhibit of the American Foundrymen's Association and allied societies in Rochester, N. Y., the week of June 5th, instead of in Cleveland as previously announced.

This decision was reached following conferences on January 18 and 19, with Mayor Kohler of Cleveland, at which time it was learned that due to the incomplete condition of Public Hall, uncertainty as to when it would be open to the public, and the manner in which it would be operated, it would be impossible for them to give a lease for any specific date in 1922. And further, that because of these conditions the present administration could not honor the agreements which the previous administration had entered into with the American Foundrymen's Association.

ROCHESTER UNANIMOUS CHOICE

Prompt consideration to other locations was given. The Convention Bureau of the Rochester Chamber of Commerce had previously extended a cordial invitation for this year's meeting, backed by assurances of 100% support on the part of Rochester foundries and other civic bodies. All these were promptly reaffirmed by Rochester with the result that this city, which has been given favorable consideration for several years, was made the unanimous choice of the Convention and Exhibits Committee, and of the Board, for a convention the week of June 5th.

SPLENDID ACCOMMODATIONS

All the activities of the association will be centered at Exposition Park, Rochester's million dollar show place, located only a mile and a half from the center of the city. Comfortable and commodious assembly rooms for general and auxiliary meetings are available, while buildings Nos. 3, 4 and 5, all directly connected, afford better accommodations for all classes of exhibits than have been found in any other city where exhibits have been held.

Rochester's geographical location is good, being only a night's ride from all points in New England, and as far west as the Chicago District, as far south as Cincinnati and Washington and intervening points, and convenient to points in Canada either by rail or by boat from Coburg, Ont., direct to the Port of Rochester, making it a central meeting point for the foundrymen of the east, west, north, and south, where they will gather together to discuss problems of great interest and value to all. At the exhibits the western manufacturers of equipment will have an opportunity to meet the eastern buyers, and western buyers will meet half way the eastern manufacturers and dealers.

HOTEL ACCOMMODATIONS

Rochester would have been first choice for two previous fall

EXPOSITION PARK, ROCHESTER, N. Y., WHERE THE FOUNDRYMEN'S CONVENTION WILL BE HELD THE WEEK OF JUNE 5, 1922

conventions had they been able to offer a greater number of hotel rooms. For a June Convention it has been possible for them to increase their guarantees, and the committee feels certain that all members and guests can be comfortably taken care of. A plan is being worked out for handling all reservations through a hotel committee, to which each hotel has pledged a large quota of rooms; reservation and application blanks with complete information will be issued as soon as the hotel committee is organized.

ATTRACTIONS

Rochester and the surrounding country has many attractions for the tourist and autoist, and June is a beautiful month in this section of the country. Every foundryman should correct his convention memo on his calendar and reserve the week of June 5th for profit and pleasure in the City of Rochester.

INSTITUTE OF METALS DIVISION

HEADQUARTERS, 29 W. 39TH ST., NEW YORK

The program of the New York meeting to be held at 29 W. 39th Street is as follows:

MONDAY, FEB. 20, 1922

2 p. m.—Room 3. Chairman, W. H. Bassett.

Results Achieved by Corrosion, Committee of British Institute of Metals. By E. E. Thum.

Experiments with Sherardizing. By Leon McCulloch.

Spectrum Analysis in an Industrial Laboratory. By Wm. H. Bassett and C. H. Davis.

Arsenical Bearing Metals. By Harold J. Roast. Illustrated by lantern slides.

TUESDAY, FEB. 21, 1922

10:45 a. m.—Room 1.

Colloid Chemistry and Metallurgy. By Prof. Wilder D. Bancroft.

2 p. m.—Room 3. Chairman, W. H. Bassett.

Business Session of the Division.

Slip Interference Theory of Hardening of Metals. By Zay Jeffries and R. S. Archer.

Crystal Structure of Solid Solution by X-Rays. By Edgar C. Bain. Thermal Expansion of Copper and Some of its Important Alloys (Bureau of Standards). By P. Hidnert.

Thermal Expansion of Nickel, Monel Metal, Stellite, Stainless Steel and Aluminum (Bureau of Standards). By P. Hidnert and W. Souder.

Studies on the Constitution of Binary Zinc-base Alloys. By Willis McG. Peirce.

BRITISH INSTITUTE OF METALS

HEADQUARTERS, 36 VICTORIA ST., WESTMINSTER, LONDON, ENGLAND

The Institute of Metals has had a very successful year. Its membership has grown in 1921 from 1298 to 1410. The meetings have been well attended, that in Birmingham in September, 1921, being a record gathering, attracting members from the United States, France, Belgium and other countries. Work has been published by the Institute dealing with practically every non-ferrous metal. In 1922 special attention is to be devoted to the corrosion of non-ferrous metals, and meetings are to be held in London in March and May, and in Swansea in September. Sir Ernest Rutherford, F.R.S., whose work on atomic constitution is world famous, is to deliver the Annual May Lecture on "The Relation of the Elements."

The annual meeting of the institute will be held in London on March 8-9, when ten important papers are to be presented for discussion. At the annual dinner at the Trocadero restaurant on Wednesday, March 8, lady members, as well as many distinguished guests of the council, will be present.

The annual May lecture will be delivered on May 3 by Sir Ernest Rutherford, F. R. S. on "The Relation of the Elements." The discourse should throw fresh light on the much debated subject of the possible transformation of one metal into another.

The Autumn meeting of the institute will be held—for the first time—at Swansea on September 20-22. A large gathering is expected in this important metallurgical centre, to which the Mayor and corporation have extended a very hearty invitation to the Institute of Metals.

From October to December (as well as during the present quarter) meetings of the various local sections of the institute-membership of which is free to members of the parent body—will be held in London, Birmingham, Sheffield, Glasgow, Newcastle-on-Tyne, and elsewhere.

Prevention of Corrosion. The Institute of Metals has just issued a practical pamphlet of 32 pages giving in summary form the results of over ten years' research into the causes and prevention of corrosion in condenser tubes. The pamphlet, which is one that will appeal particularly to all engineers, can be obtained, price 2s. 8d. post free, from the Institute of Metals, 14 Members' Mansions, London, S. W. 1.

NEW YORK BRANCH, A. E. S.

HEADQUARTERS, CARE OF E. HAAS, 504 E. 163D ST., NEW YORK

The regular meetings were held at the Broadway Central Hotel, Dec. 8, and Dec. 23, 1921.

President J. H. Stremel presided. The main topics under discussion were our Banquet and Founders Meeting, which are to take place all in one in Feb., 1922.

Problems discussed were, testing of nickel solutions for acid, Jap bronze, streaks in silver plating, Dutch silver, and electric wiring.

The regular meeting of N. Y. B. of the A. E. S. was held at the Broadway Central Hotel, N. Y., Jan 13th and 27th. President Stremel presided. Five applications were received and referred to the board of investigating committees. The last meeting of January brought out a good number of old timers which made the meeting a very interesting one. The main topics under discussion were jap bronze chemically finished, by Mr. John Burke; Verde Antique green finishes produced productively by

Mr. Phillip Morningstar; fluoborate nickel solutions; generators and their upkeep.

Charles H. Proctor will conduct the entire session which will be called Founders Meeting, the afternoon of the Banquet.

INDIANAPOLIS BRANCH, A. E. S.

HEADQUARTERS, CARE OF LOUIS MERTZ, 1728 UNION ST., INDIANAPOLIS, IND.

The Branch held its regular meeting Jan. 14th, 1922 with Pres. Hennessey presiding over a good attendance. One application was received and one honorary member elected, Mr. C. H. Humphreys of The Utilite Process Company, Kokomo, Ind. Mr. Wm. Cartheuser was appointed to fill a vacancy in the Board of Managers. It was decided that we hold a smoker and get-together meeting next Feb. 11th. Mr. James Walsh now connected with The Utilite Process Company brought out some discussions on the process of Utiliting which were interesting and as this subject is coming up in a formal way later a description of the process can be given out.

CHICAGO BRANCH BANQUET

HEADQUARTERS, CARE F. J. HANLON, 2855 N. RICHMOND ST., CHICAGO, ILL.

As per custom, this annual event took place on January 20, at the Chicago Elks Club, 174 W. Washington street. All enjoyed every minute of the time, and we are sure every word spoken was heard by everyone anywhere in the hall. The papers and addresses were very good, the entertainment features excellent, and the inner man feasted as never before, hence we will "tell the world" it was **some event.**

Intellectually the program was up to the usual standard for which the banquet has become nationally noted. The president of the branch, George Burt, delivered the address of welcome, after which he introduced Oscar E. Servis, Past Supreme President of the A. E. S., as the toastmaster of the evening. This in itself would insure the success of almost any event, and we are sure that all will agree with us that "Oscar" did a very good job. He is noted for doing good work anyway.

After the address by the toastmaster he introduced J. C. Kretschmer, who read a paper upon the subject of "Chemical Analysis of Brass Plating Solutions." This was followed by Water J. Allen, Editor of the Review. Using that title as his subject, also using plain English, Walter sure did himself proud, and we are sure his talk will not only make the members appreciate the Review more, but will also help in getting material for it.

Someone on the committee has been accused of being a "sleuth," but let that be as it may, we know that when any of them start out to accomplish something they usually get results. When we started on the scent of getting a speaker upon a subject of **Public Interest,** the idea uppermost in our minds was to get a good one, so the detective or "sleuth" located one of the good friends of the society in the person of Harry De Joannis, founder of the Metal Record, and his talk was surely worth going miles to hear, particularly in view of his knowledge of our work in the society as a whole.

The paper upon the subject of Cadmium Plating, by Mr. Humphries, chemical engineer, brought out any number of good points, and the center of interest was drawn to this feature since it is new. The samples displayed also created quite a good deal of interest. This paper will be published in the Review among the others.—F. J. HANLON.

AMERICAN ELECTROCHEMICAL SOCIETY

HEADQUARTERS, CARE OF DR. C. G. FINK, 101 PARK AVE., NEW YORK

The Forty-first Meeting of the Society will be held in Baltimore, Md., April 27, 28 and 29, 1922. This will be the first meeting the Society has held in Baltimore, although two meetings have taken place in the Nation's Capital.

The many industrial plants located in the vicinity of Baltimore lend abundant opportunity for inspection trips. This, coupled with a program of good technical papers toward the three specially planned sessions on Electric Furnace Cast Iron, Gases of the Electrochemical Industries and Electromotive Chemistry, should make the meeting very interesting and attractive.

The Local Committee, with Mr. Wm. H. Boynton, Chairman, is actively engaged in making arrangements; one evening has been reserved by the Committee for a smoker and social gathering. The splendid opportunities for various forms of recreation and the close proximity of Washington should prove to be additional influential attractions to all members.

All technical contributions intended for this meeting should reach the Secretry's Office as soon as possible and not later than March 1, 1922. Members are respectfully requested to send in the titles of their manuscripts early, so that proper arrangement may be made on the program.

SOCIETY FOR TESTING MATERIALS

HEADQUARTERS, 1315 SPRUCE ST., PHILADELPHIA, PA.

The Twenty-fifth Annual Meeting of the A. S. T. M. will be held from June 26 to July 1, 1922, at Atlantic City, N. J., with headquarters at Oralfonte-Haddon Hall Hotel.

METROPOLITAN BRASS FOUNDERS

HEADQUARTERS, CARE OF WM. E. PAULSON, 97 SECOND AVENUE, BROOKLYN, N. Y.

At the last meeting the following officers were elected: President, F. H. Landolt of Penn Brass & Bronze Wks., Brooklyn; Vice-president, W. D. Goldsmith Co., Newark; Secretary and Treasurer, W. E. Paulson of Thos. Paulson & Son, Brooklyn.

Members of the Executive Committee are: Thomas Harper of Thomas Harper, N. Y. City; Jos. Bechtold of New York Brass Foundry, New York City; Thos. Williams of E. A. Williams & Son, Jersey City.

WASTE MATERIAL DEALERS

HEADQUARTERS, TIMES BUILDING, NEW YORK CITY

The National Association of Waste Material Dealers will carry on during February, 1922, a campaign for new members. Quotas are as follows: New York and vicinity, 10; Philadelphia and vicinity, 5; Chicago and vicinity, 5; St. Louis and southwest, 5; Boston and New England, 5; Pittsburgh and vicinity, 3; Buffalo, 3; Cleveland, Akron and Youngstown, 5; San Francisco and Pacific Coast, 3; Detroit, 3; Cincinnati and Southern Ohio, 2; Toronto, Ontario and vicinity, 2; Baltimore, 2; Washington, D. C., and Virginia, 2; Kansas City and vicinity, 2; Milwaukee, 2; New Orleans, 1; St. Paul and Minneapolis, 1; Indianapolis, 1; Albany and Troy, 1; Rochester, 1; Newark, N. J., and vicinity, 1; total, 65.

HOROLOGICAL INSTITUTE

HEADQUARTERS, CARE OF NATIONAL RESEARCH COUNCIL, 1701 MASSACHUSETTS AVE., WASHINGTON, D. C.

The unstabilized and unstandardized condition of the watchmaking profession in this country aroused the interest of the National Research Council, which called the first horological conference in Washington, D. C., May 19th and 20th, 1921, at which were represented every branch of the jewelry and watchmaking industry, the American National Retail Jewelers' Association, the Smithsonian Institute, the United States Bureau of Education, the United States Bureau of Standards, the Federal Board for Vocational Education and the trade and daily press.

Two other conferences were held and the Horological Institute of America was formally established and an advisory council of twenty-four and presiding officers were elected. It aims to be of service to every branch of the industry and to individuals interested in any way in precision in timekeeping. The certification of watchmakers is only one of the Institute's functions. The Institute decided upon three grades of certificates, a first, a second and a third grade, in order to encourage certification and to make it available for as many applicants as possible.

Standardization and certification, it is hoped, will advance the professional standing of the watchmaker's vocation and make it more inviting to the intelligent youth of this country.

PERSONALS

ITEMS OF PERSONAL INTEREST

Jay P. Orben, who for many years was with the Hanson and Van Winle Company, Newark, N. J., covering the New York City territory, has started in business at 81 Walker street, New York, where he is handling platers' and polishers' supplies.

Edward T. Homan has resigned as treasurer of John B. Fay & Company, Inc., 428 Sansom St., Philadelphia, Pa.

T. Wolfson, of the United Metals Selling Company, 25 Broadway, New York, has accepted the chairmanship for the Metals and Mining Industry Division of the $5,000,000 New York City campaign for the relief of Jewish war sufferers. Associated with him in the campaign are L. Vogelstein and Julius Loeb, of the American Metals Selling Company, 61 Broadway; A. A. Singer, of Adolph Lewisohn Sons and Company, of the same address, and D. M. Rosenthal, of the United Metals Selling Company.

The **Ajax Metal Company,** Philadelphia, Pa., have appointed **H. L. Carpenter, Jr.,** formerly in charge of their Pittsburgh office and later connected with their main office in Philadelphia, as traveling representative in Western Pennsylvania. Mr. Carpenter has been with the Ajax Metal Company for over 20 years, and has a long intimate acquaintance with his many friends in Western Pennsylvania.

Zeno D. Barns has been appointed manager of the Cleveland office of the Ajax Metal Company, Philadelphia, Pa., located at 429 Schofield building. He succeeds the late Mr. Louis E. Purnell. The Cleveland office covers the states of Ohio and Michigan. Mr. Barns for some years past has been connected with the Westinghouse Electric and Manufacturing Company and the Westinghouse Air Brake Company, and has many friends in the non-ferrous metal trade.

Ernest V. Pannell, of the British Aluminum Company, with offices at 165 Broadway, New York, is leaving for Japan, where he will remain for several months. His mailing address is care of the English Electric Company, Tokio, Japan.

The Bridgeport Brass Company has announced the appointment of **W. D. Blatz** as their general sales manager. Mr. Blatz joined the marketing organization of the Bridgeport Brass Company in 1915 at the age of 30, after having had 12 years' experience in the banking and brokerage business where he became well-known in financial circles. During his six years connection with the company, he has made a thorough study of the brass industry in all its various branches and has traveled extensively.

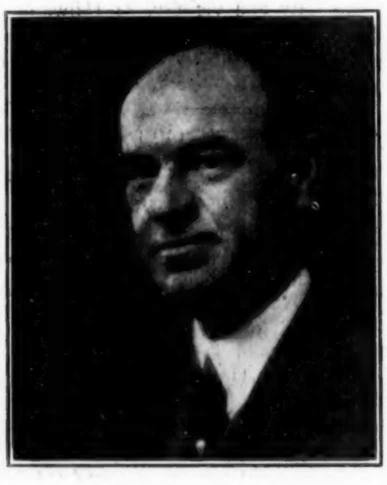
F. M. Feiker, vice-president of the McGraw-Hill Publishing Company, who for the past eight months has been assisting Secretary of Commerce Herbert Hoover in the reorganization of the department has resigned. Mr. Feiker has not, however, completely severed his relations with the secretary or the department. He has been appointed a special agent of the Bureau of Foreign and Domestic Commerce to continue in a consulting capacity the work he has been rendering. Under the direction of Mr. Feiker and Dr. Julius Klein, director of the Bureau of Foreign and Domestic Commerce, the industrial and business contacts of that bureau have been enlarged, business relations with trade association committees have been established and the so-called Commodity Divisions of the Bureau created.

The Cleveland Electric Tramrail Division of The Cleveland Crane and Engineering Co., has announced the appointment of **L. E. Salom,** as district representative for their New York territory. Mr. Salom will make his headquarters at 50 Church St., New York City and his vast personal experience with production and labor-saving equipment is at the service of the trade.

DEATHS

HENRY ALDEN CARPENTER

Henry Alden Carpenter, aged 55, of the General Fire Extinguisher Company, Providence, R. I., died at his home January 27. He was born in Providence, July 7, 1867. In 1889 his father, brother and he established the Alva Carpenter & Sons Foundry Company. The Carpenter company was merged with the General Fire Extinguisher Company in 1911 and Mr. Carpenter joined the new organization, becoming manager of the five foundries of the company, plant manager of the Auburn establishment, member of the executive board, publicity and promotion manager, and a director. He held these offices at the time of his death.

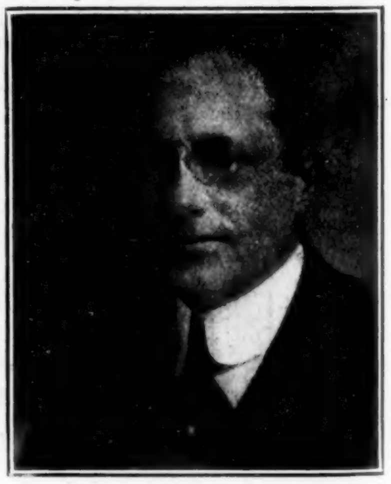


HENRY ALDEN CARPENTER

Mr. Carpenter was president of the New England Foundrymen's Association for a number of years. He joined the American Foundrymen's Association in 1896, was vice-president in 1905 and 1913 to 1916, and one of the incorporators when the association was incorporated July 3, 1916. He was a member of the National Foundries' Association, vice-president for three years before November, 1908, when he became president. He was president during 1908-1909.

ARTHUR SEYMOUR BROWN

Arthur Seymour Brown, vice-president of the Ansonia branch of the American Brass Company and one of its most trusted officers, died at his home on the Grassy Hill Road, Orange, Conn., Wednesday, January 11, 1922. He had been ill for upwards of twelve weeks, and for some time was under the observation of a specialist, and was thought to be on the road to recovery. He was preparing to go on a Southern trip for rest and recuperation when stricken with paralysis of the throat, and, pneumonia setting in, there was no hope felt for his recovery.



ARTHUR SEYMOUR BROWN

Mr. Brown was one of the industrial leaders of the Naugatuck Valley and was widely known throughout Connecticut and other states, where the business of the corporation took him. He had filled important positions in the manufacturing industries of Ansonia for more than twenty-five years. He was born in Brooklyn, N. Y., on October 24, 1877, the son of the late Charles E. and Ella T. Brooker Brown, and was in his forty-fifth year. He was educated in the schools of Brooklyn and Bridgeport, and in 1896 came to Ansonia, where he became identified with the Coe Brass Manufacturing Company.

When this concern became merged with the American Brass Company, Mr. Brown became one of the officers of the new company, and has served for a number of years as vice-president of the Ansonia branch. He was a member of the price committee of the company and chairman of the eastern selling committee at Waterbury.

During the war period, Mr. Brown showed much enthusiasm and activity in the work of creating the home guard in his state, serving the state for a long time and later becoming captain on the headquarters staff at Hartford. He was a member of the Manufacturers' Club of Ansonia, and various country and other clubs. He was also a Freemason and an Elk.

The funeral took place on January 13 from his residence in Orange, among the pallbearers being George H. Allen, H. Mitchell Wallace, R. S. Wildman and William H. Rippere; all of the American Brass Company. He is survived by his widow, Mrs. Ruth S. Brown, two sons, Seymour and Donald, three brothers and three sisters.

JAMES J. ALLEN

James J. Allen, general manager of the Monarch Engineering and Manufacturing Company, Baltimore, Md., died of heart failure at his home in Baltimore, January 23, 1922. He was in excellent health up to the moment of his death.

TRADE NEWS

BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS

WATERBURY, CONN.

Feb. 1, 1922.

The proposal last month of the **Anaconda Copper Mining Company** to acquire the capital stock of the **American Brass Company** is being rapidly consummated this month. The officials of the latter company in a letter to the stockholders made known the offer as detailed in these pages last month, namely $150 and three shares of the non-assessable capital stock of the Anaconda Company for each share of American Brass stock.

The Anaconda company agreed to take all or any portion of the Brass company stock, but not less than 51 per cent of the total outstanding, provided it was deposited before January 31. The offer closed on that date. The depositories named were the Mechanics & Metals National Bank of New York and the Colonial Trust company of Waterbury. At last reports 107,000 shares of the total 150,000 shares of American Brass stock had been so deposited, which being more than 51 per cent of the total, is evidence that the merger has been effected. The old stockholders of the American Brass company profited also through a dividend recently declared before the transfer was effected, amounting to $1.50 on each share.

Local apprehension that the coming merger might result disastrously for this section, possibly by the removal of the brass business nearer to the mines and possibly by competition of the consolidated companies with the smaller local companies was largely dissipated by Chairman John D. Ryan and President Cornelius F. Kelley of the Anaconda company in addresses given before the local Rotary club January 5.

"The prosperity of the Anaconda Copper Mining company is the prosperity of the Naugatuck valley, and the prosperity of the Naugatuck valley is the prosperity of the Anaconda company," declared the former. "It is natural that the people of the Valley should want to know what we propose to do, and I can assure you that in this proposed partnership with American Brass we expect to make a partnership with the people of the valley, we expect to expand the industry to meet the normal and safe demands of trade, and I can pledge to you that the growth of these communities in the future will be equal to the sane and orderly growth of the past.

"To our competitors I also want to say that we come as friends. We will maintain the high ideals of the American Brass company and we will do our business as friends so that not only will our competitors respect us but also that we will hold their friendship." This plain statement was in answer to a question of Mayor F. P. Guilfoile as to what the Anaconda men were going to do, as the fortunes of the whole community depended on their attitude.

Mr. Ryan said that copper mining had not given the returns for the money invested that manufacturing had and for that reason Anaconda had looked about for a chance to tie up with the manufacturing end. They had investigated the American Brass for six months, he said, but had been examining the brass industry in the Naugatuck valley for a much longer period, which, he said, "took all the copper we dug, made it into brass and kept the profits," so he naturally wanted to know how they did it.

"Were we to select a place today for the manufacture of brass and were there no brass factories on the Naugatuck, we could find no place better suited than this valley," he said. "You are close enough to the great consuming markets and you have as favorable freight rates as any other section. With your brass industry already established you have a commanding position. Your trained force of brass workers, people who have lived here until brass making is almost a guild, is a tremendous asset. Any man who wanted to take from this valley its brass factories and move them somewhere else would show poor judgment. Of course no one section can reach all of the markets of the country but there is no one section which is better adapted to supply the markets than is the Naugatuck valley. It was from the very start one of our provisions that in this merger, the trained organization of the American Brass company should come over complete. The knowledge of the art and the trained employees which you have are just as important to us, nay are more important than the bricks and mortar which are the plants which we are buying."

Holding their own is the best that can be said of the local plants so far as amount of business and number of employees are concerned this month. Practically all the plants are running on the same time and with the same number of hands as last month. Although there has been no increase in orders, and in some plants a decrease, a genuine note of optimism prevails in the belief that from three to six months will see better times.

Alvin Gillett, for the past five years in the employ of the Chase companies, became secretary of the Waterbury Chamber of Commerce this month. He came to the employ of the former company during the war in the capacity of a welfare worker, to stimulate a better social feeling among the employees. Officials of the company felt that the new position of Mr. Gillett was one for which he was eminently fitted, and in line with his capacities.—W. B.

TORRINGTON, CONN.

Feb. 1, 1922.

Nearly one-third of the taxes paid in the town of Torrington are paid by the metal industrial plants. The total grand list of the town, according to figures made public during the past month by the assessors, is $26,581,705. The nine leading plants engaged in the manufacture of metal products are assessed for an aggregate of $8,600,948. Factories alone, exclusive of stock, are assessed for $5,291,603. Following are the assessment lists for the various metal shops:

American Brass Company, $3,647,175; Excelsior Needle, $1,044,377; Standard Plant, $1,165,110; Hendey Machine Company, $985,202; Union Hardware Company, $733,890; Turner & Seymour Mfg. Company, $446,117; Progressive Manufacturing Company, $263,707; Torrington Manufacturing Company, $219,850, Fitzgerald Manufacturing Company, $95,520.

The annual meeting of the Maria Seymour Brooker Memorial was held during the past month. James A. Doughty was re-elected president. Other officers are: vice-president, Mrs. Robert C. Swayze; treasurer, John M. Wadhams; secretaries, Mrs. John B. Lyon and Mrs. T. L. Thomson; general counsel, W. A. Roraback; managers, F. L. Braman, Mrs. Thomas W. Bryant

and John M. Wadhams. The various committees were reappointed, only two changes being made. F. L. Braman was added to the committee on finance and auditing and Mrs. E. E. L. Taylor to the committee on the nurses' home. The treasurer's report showed receipts of $21,348.34 and disbursements of $17,118.50. A summary of the work done by the memorial has already appeared in the Metal Industry.

John Cook, 75, father of **Harmon J. Cook,** works manager of the Standard plant, died January 9. The deceased was a native and lifelong resident of Torrington. S. H. T.

NEW BRITAIN, CONN.

Feb. 1, 1922.

"If business continues to improve during the next few months as it has during the past few months we will not have to worry about the immediate future."

The above statement was issued at the **North and Judd Manufacturing Company** in reply to the query as to present business conditions. Following up this statement, it was explained that the business improvement, while not of the boom variety, is a steady growth. For the past few weeks there has been a growing demand for North & Judd Manufacturing company articles, but the most gratifying part is, it is said, that the old time, pre-war buyers, are returning to the market. "While they are not ordering in big quantities, they are ordering and that is something," it is stated.

At the other factories business conditions are slowly improving. The **P. & F. Corbin** factory is plugging along on a 55-hour week basis and are actually turning out about as much work as they did before the war. The orders being received are also gratifying.

Landers, Frary & Clark is running along in a steady, routine way, with business showing a slight improvement over last year and the same holds true at the Stanley Works and the Stanley Rule and Level company.

One of the most important events in the local manufacturing circles since the appointment of Charles F. Smith, chairman of the board of directors at Landers, Frary & Clark's as temporary head of the New Britain Machine Company, is the purchase by the Hart and Cooley Manufacturing Company of the Hart and Hutchinson Manufacturing Company. The deal involves approximately $300,000 and combines two of the most modern pressed steel manufacturing companies in this section. H. R. J.

ROCHESTER, N. Y.

February 1, 1922.

For the first time in more than a year a real feeling of optimism prevails among Rochester manufacturers. This feeling is based upon an actual improvement in business since the first of the year and to prospects which apparently are of a most encouraging character.

Inquiry among the larger plants about the city reveals the fact that more men and women are employed steadily or part time than at any period in fully a year. Business is actually better, it is claimed, and it is expected that before the summer season has been reached that the improvement will have been greatly increased.

This condition is true in so far as such large concerns as the **Eastman Kodak Company, the Bausch & Lomb Optical Company, Pfaudler works, General Electric Company, Todd Protectograph Company, and Yawman & Erbe** are concerned. The **Rochester Can Company** is running at full tilt, and several of the machine shops about the city have added to their corps of employees. Purchasing agents report a better demand for all metals, and representatives throughout the country declare that there is a stronger demand for Rochester products.

Owing to the unusually large amount of building and interior work taking place in Rochester this winter, due to a plan evolved by the Chamber of Commerce and the Rochester Builders' Association, the demand for finished metal materials is very firm just now. Particularly is this true in copper, brass, zinc, bronze, aluminum, tin and lead. Wholesale dealers in sheet brass and brass rods, as well as copper and tin plate, report a much more satisfactory trade since the holidays. G. B. E.

TRENTON, N. J.

February 1, 1922.

The involuntary petition in bankruptcy filed in New York in December against **Robert H. Ingersoll & Brother,** watch manufacturers, has had no effect as yet upon the big plant of the company at Trenton. No immediate shutdown of this plant is likely. Operations will continue under the court's supervision until the receiver has had an opportunity either to rehabilitate the business or sell it to the best advantage at once. The creditors declare the company's liabilities are in excess of $3,000,000 and its assets in excess of $2,000,000.

Articles of amendment to the incorporation papers of the **J. L. Mott Company** were filed at Trenton recently. The concern, which manufactures plumbing, steamfitting and electrical fixtures, has an authorized capitalization of $3,000,000. According to Robert K. Bowman, vice-president of the concern, the amendment to the charter increases the number of directors from seven to nine, but the new directors have not yet been decided upon. Of the 26,740 shares, 19,759 are held by Jordan L. Mott, Oliver O. Bowman, Marie MacLean, W. J. J. Bowman, Edward A. Quinn and Edward Hammann.

Value of the estate of the late **Charles G. Roebling,** president of the **John A. Roebling's Sons Company,** Trenton is $15,355,671.32, according to the executors' account filed at Trenton. The principal beneficiaries are Mr. Roebling's two married daughters living in Philadelphia. The great bulk of Mr. Roebling's wealth consisted of 45,000 shares of the Roebling Company, valued at $7,020,000. He also owned $78,600 worth of stock in the Mercer Automobile Company.

Announcement has been made by the **Raritan Copper Works,** the Perth Amboy, N. J., plant of the **Anaconda Copper Company,** that copper shingles will soon be manufactured. It is also reported that a plan to make copper gutters and leaders is under consideration. Machinery will be installed shortly for the turning out of the copper shingles. When this new department is started more hands will be employed and impetus given to the industry which has suffered a serious curtailment recently. There is a large supply of refined copper now stored at the Perth Amboy plant which is ready for use.

Samuel Cohn, a hardware dealer, of 736 Washington street, Hoboken, has filed a petition in bankruptcy in the United States District Court at Trenton.

Frederick F. Katzenbach, of the firm of **Katzenbach & Bullock,** chemical dealers, Trenton, has been made a defendant in a suit brought in the United States District Court by the National City Bank, of New York City. The litigation is to recover $19,487.31, which the plaintiff alleges is due on a contract of guaranty.

Bert Gessler Company, Inc., of Paterson, N. J., has been incorporated at Trenton with a capital stock of $100,000 to deal in sheet metal. The incorporators are Bert Gessler, William Neipenberg and Paul W. Frenzel, of Paterson.

Fire recently caused a loss of about $5,000 to the brass foundry of **Joseph Keegan,** Doremus avenue, Newark, N. J.

William G. Wherry, president of the **Skillman Hardware Manufacturing Company, Trenton,** has been appointed a member of the Board of Education at Trenton.

Articles of incorporation have been filed by **Joseph Gordon, Inc.,** Trenton, to deal in new and old metals, etc. The capitalization is $50,000 and the incorporators are Joseph Gordon, Yetta Gordon and Max Siet. The company has offices in the Wilkinson building, Trenton.

The **Auto Hardware Company,** of 274 Halsey street, Newark, has filed a petition in bankruptcy in the United States court at Trenton. The petition was referred to Charles M. Mason, referee in bankruptcy at Newark. The liabilities were listed at $6,893 and the assets at $2,699.

J. Seymour Crane, Inc., of Montclair, N. J., has been incorporated at Trenton with $50,000 capital to conduct a general hardware business. The incorporators are Wolcott B.

Crane, John A. Bennett and Maud W. Crane, all of Montclair.

Frederick S. Biles, paymaster at the plant of the Jordan L. Mott Company, Trenton, N. J., died at that place on January 22 after a lengthy illness. He was 40 years old and was a prominent member of the Masonic Fraternity. He is survived by a widow. Mr. Biles had been employed at the Mott plant for some time. C. A. L.

CLEVELAND, O.

February 1, 1922.

First month of 1922 confirms predictions made late last year that the turn of the year would bring a comeback in big business. The few weeks just past have shown that industry as a whole, and those interests identified with the metal industries in particular, are ready to go ahead. In fact, many interests have started consistent campaigns for new business, and, significantly enough, have been cashing in.

Since the automotive industry here is one of the principal outlets for the metal industries, the development of the motor bus business here is significant. The **G. C. Kuhlman Car Company** and the **Gustav Schaefer Wagon Company** are producing these vehicles in increasing numbers since the beginning of the year. The **J. B. Brill Company,** Philadelphia, likewise is developing its bus production in Cleveland plants. At the present rate of production, it is the belief of leaders in this particular industry and those associated with it, that in the next two or three years bus production will equal that of street car construction. Not a little of the demand is coming from street car companies who will use busses for extensions, and from interurban companies who will use these for feeders. This demand is aided by the fact that busses can be delivered in a few weeks time, and do not require expensive trackage, points out **L. G. Sircoulomb,** of the Kuhlman plant. Best demand is seen from the central and far west, according to **Ernest Schaefer,** of the Schaefer concern.

The biggest demand for regulation motor cars will come from the larger cities, in the opinion of Edward S. Jordan, head of the **Jordan Motor Car Company,** who addressed the January meeting of the Exchange Club. The reason for this, he explained, is that the cities are not affected directly by the agricultural conditions and markets. The expectations for the larger city motor car demand during 1922 is based upon the bigger bond purchases in the cities during the last six months of 1921, Mr. Jordan explained.

Increased demand upon its output has required extension to its plant by the Empire Plating Company, and 10,000 feet in the Vlchek Tool Company's plant in the East End have been taken, R. T. Scott, general manager, announces. Mr. Scott, formerly was purchasing agent for the Peerless Motor Car Company. The Empire will specialize in polishing and nickel plating radiator shelves, and with the installation of additional machinery will double its present capacity.

Plans for producing and putting on the market 1,000 steam automobiles this spring are being completed by the **MacDonald Steam Automotive Company** at Alliance. C. C. C.

DETROIT, MICH.

Feb. 1, 1922.

Optimism, enthusiasm and determination seem to be generally expressed by everyone who is in any way connected with the metal business. While business in general is at a stagnation point almost everyone seems encouraged over the future. It is believed business would have shown something of an improvement before this, if it were not for the severe weather that has prevailed for some time past. People are not thinking so much about spring business when the mercury is at the zero point.

The annual automobile show has been the center of attention during the last week. This, of course, has a considerable bearing on the general metal industry, for it marks in Detroit, at least, the beginning of the spring campaign of the automobile industry, which is one of the greatest consumers of brass, copper and aluminum in the city and vicinity. With the exception of the great Ford Motor plant in Highland Park, practically all the automobile concerns have been closed for several weeks. Directly following the show most of these idle ones will begin on their spring manufacturing, and what that means to the metal industry, only those who really know can appreciate.

Outside the automobile and accessory industry there is not much to say as to the metal industry future. The business is dead, and has been for a long time. It looks now as if the only hope is a readjustment of foreign conditions and the opening up of the European trade. When that will be no one can tell, although much is expected of the armament conference in Washington.—F. J. H.

INDIANAPOLIS, IND.

February 1, 1922.

Announcement was made recently that **W. C. Starkey,** formerly of Indianapolis, a graduate of Purdue university, had resigned as chief engineer, patent specialist and member of the board of directors of the **Ohio Brass Company** of Mansfield, O., to become vice president and factory manager of the **Stevenson Gear Company** of Indianapolis. Mr. Starkey will assume his new duties this month.

Officials of the **Reliance Foundry Company** at Richmond, Ind., have announced that plans are being drawn for construction of an addition to their factory there. The expansion will cost about $25,000.

A meeting of the creditors of **Elwood Foundry Company,** at Elwood, Ind., was held in Elwood recently. The company filed a voluntary petition in bankruptcy in Federal Court in Indianapolis.

Albert A. Hoffman, of the **Pioneer Brass Works,** of Indianapolis, has been named a member of an advisory committee of business and professional men to consult with Mayor Lew Shank of Indianapolis in the solution of civic problems.

The **Gartland Danville Foundry Company** has been organized at Danville, Ind., with a capital stock of $10,000, for the purpose of operating a foundry. Directors of the new company are C. E. Swank, C. P. Osborn and O. V. Coon. Other companies organized by the same men are the Gartland Foundry Company, Terre Haute, Ind.; Peru Foundry Company, Peru, Ind.; Atlas Foundry Company, Marion, Ind.

The **Brass Foundry & Machine Company,** of Fort Wayne, Ind., has filed articles to increase its capital stock from $1,700,000 to $2,100,000. The amount of $400,000 will be raised by an issue of 6 per cent cumulative stock, which is to be used to replace bonds of the company, officials state.

Fire recently damaged the **Studebaker Corporation** foundry at South Bend, Indiana, to the extent of $8,000. Seven hundred men were thrown out of work. The fire started in the cupola of the melting department on the top floor, and was confined to the upper floor by the fire department. The night shift on the lower floor continued work while the firemen fought the flames. E. B.

BALTIMORE, MD.

February 1, 1922.

The **Florence Silverplate Company** is preparing to move into new quarters at 408 Hanover street, where alterations are now being made and a new one-story brick addition is being constructed. **W. J. Eisenhart** is manager.

The **Phillip-Kell Company,** Clarkson and McComas streets, engaged in the sheet metal business, is erecting a large plant at the corner of Holliday and Centre streets.

An order has been signed by Judge John C. Rose of the United States District Court adjudicating the **Zircontum Company of America,** engaged in the manufacture of metals, with a plant in Baltimore, a bankrupt. The order was signed upon petition filed by Gus A. Morton and others, alleged creditors of the defendant in sums aggregating $1,203.02.

The **Parker Metal Decorating Company,** E. A. Parker president, has taken over the plant formerly occupied by the Union Smelting and Refining Company at Ostend and Howard streets. The plant is to be enlarged by the construction of an addition.

The **Curran Motor Raditor Company** has acquired property on Hanover street as a site for a new plant, 40 by 180 feet. The initial unit will cost about $30,000. W. J. L.

LOUISVILLE, KY.

February 1, 1922.

The general situation in Louisville shows very little change, there being a little business, but in many lines manufacturers are allowing stocks to run down to about the vanishing point. This will probably mean better buying when it comes time for replenishing.

Coppersmiths are finding business dull. The local brewers are doing very little, as some of them have been closed down by the Government for violation of the prohibition laws. Distillers are showing no inclination to operate. Canners are uncertain and not making any improvements. There is just a little scattered work, but nothing big.

Railroad prospects are better it is said, and announcement has just been made that the **American Car & Foundry Company**, at Jeffersonville, Ind., has received some fair contracts for passenger coaches, which will mean a good deal of brass goods.

The **Louisville Railway Company** has some big projects in sight if it ever secures a decision in its fight for a seven cent fare, but in the meantime is holding down all costs to the minimum.

Plumbing goods look fine as building operations are very promising. The **Standard Sanitary Manufacturing Company**, Louisville, is running full, and steadily enlarging its plant.

George Stege, of the **Stege Brass & Plating Works**, reported that business was quiet, but that spring business looked promising, as he believed sales of new autos would be slow, and that far more money would be spent in fixing up old cars this year than in former years.

The **Independent Brass Works** reports that it has secured some mighty good casting business on dust spraying machines of the **Dosch Chemical Company, Louisville,** which is assembling its machines, some of which are full sized horse drawn farm sprayers. Most of the castings are of aluminum, there being some brass and bronze work.

During the recent annual meeting of the **National Canners Association**, the **Canning Machinery & Supplies Association**, some fine displays of canning and bottling machinery were shown, including copper cooking coils for cooking vegetables in canning factories. There were numerous exhibits of can manufacturing companies.

The **Kentucky Wagon Manufacturing Company,** Louisville, is endeavoring to form a merger which would bring a dozen auto manufacturing concerns together as the **Associated Motors Company**, and which would result in large additions to the local plant, and production here of automobiles and parts on a much larger scale than at present. A. W. W.

MONTREAL, CANADA

Feb. 1, 1922.

The first month of the year shows a slight improvement. Brass manufacturers are finding business better than they expected and the total sales for January should show up favorably. No particular line of goods are being sought after. Orders are for small quantities but the number makes up for the size of the orders.

Scrap metals are beginning to move and are beginning to hold their own as the demand is increasing. Other metals such as lake copper, tin and antimony have tapered off in price slightly. In the jewelry lines business has not shown any improvement and the prospects do not look so bright. It is the least encouraging of any of the metal trades at the present time.—P. W. B.

BIRMINGHAM, ENGLAND

January 20, 1922.

The experience of the opening weeks of the New Year has, to some extent, justified the hopes entertained among those engaged in the British non-ferrous metal industries. Manufacturers, however, have come to the conclusion that the revival will be slow and that it will be long before anything like normal conditions are regained. General flatness marked the opening of the year, but orders now are slightly on the increase. During the last week or two orders for cabinet brassfoundry from that dependency have shown a small but welcome increase, both in number and in bulk. At home the demand for cabinet goods is poor, building schemes of all kinds being held up for want of funds. In brass shop fittings there has been a fair amount of business. The furnishing trade is looking up and seems likely to provide a little more work for the brass trade than it has during the past year.

A strong element in the slowness of business is reluctance to buy on a falling market. Manufacturers in most hardware lines are endeavoring to counteract this by cuts in prices, intended to convince buyers that the desired "rock bottom" has been reached. In the non-ferrous metal trades no hope is held out of any further fall. Metal prices are stiffening, and are considered certain to increase with any decided revival of trade. One of the most notable price movements has been that in the bedstead trade. Early in December, the Bedstead Manufacturers' Federation cut down its foreign list, the reductions averaging some 15 per cent. On January 1, the home price lists were revised, so as to show reductions ranging from 12½ per cent on the highest qualities to 25 per cent on the lowest. On brass bedsteads the reductions average about 15 per cent.

Evidence has been given before a Board of Trade Committee in support of the claim of the hollow-ware manufacturers for protection under the Safeguarding of Industries Act. The makers of aluminum hollow-ware were represented by Mr. R. C. Rogers, of Buncher & Haseler, of Birmingham, their chairman of their association. He pointed out that, since the war, the productive capacity of this trade had been considerably increased, there being now thirty firms engaged in it as against twelve in 1914. A 10-inch frypan of British manufacture which cost 2s 10d was sold by the Germans here at 1s 1½d. The imports of German hollow-ware averaged in 1913, 30 tons per month, and last year they were double that figure. It was claimed that the bulk of British manufactories were working on up-to-date costing methods, and their equipment and organization were thoroughly efficient.

Very little improvement has yet been seen in the jewelry trade. Such demand as exists is still for the cheaper goods. Silversmiths are suffering from an increasing preference for electro-plated wares, but generally there has been little improvement in business for the electro-platers. Sheffield manufacturers find a growing demand for Britannia metal. In spoons and forks the competition of stainless steel has not yet proved formidable owing to the high price of the new goods. Endeavors are being made to reduce the cost of production but in this respect the electro-plate trade hopes to be able to hold its own for some time to come. G.

VERIFIED NEWS

The **General Platers' Supply Company** have taken up offices at their Brooklyn plant, 101-105 Grand street, Brooklyn, N. Y.

The **J. W. Paxson Company,** Philadelphia, Pa., moved into its new five-acre plant at Nicetown avenue and D street on January 12th, after having been forty-one years at Pier 45, North Wharves.

The **Starcast Aluminum Company,** Milwaukee, Wis., has been incorporated with a capital stock of $10,000 to manufacture aluminum parts and specialties.

The **St. Louis Platers' Supply Company,** St. Louis, Mo., announces the change of its name to **Lasalco, Inc.** The capitalization, stockholders, officers, factory, warehouses, offices and everything else about the company will remain unchanged.

The **American Metal Company**, formerly at Attleboro, Mass., is now located in Janesville, Wis. The firm is busy manufacturing gold and silver pencils and other metal novelties. They operate a smelting and refining department, toolroom, grinding, rolling mill, stamping, soldering, plating and polishing departments.

The **Ajax Electrothermic Corporation, Trenton, N. J.,** re-

cently sold a high frequency converter of 25 K. V. A. capacity, together with three Ajax-Northrup high frequency induction furnaces; and a 25 K. V. A. Ajax-Northrup high frequency converter and a special furnace for attaining a temperature of about 1,600° C, (2,912° F.).

The **Miller Metals Products, Inc.,** Syracuse, N. Y., has been incorporated with a capital stock of $125,000, of which the greater part has already been taken up. The company is a continuation of the Miller-Jones Corporation. They manufacture a line of specialties, and operate stamping, soldering, acetylene and electric welding departments.

The **Phoenix Sheet Metal Stamping Company,** 2823 Fletcher street, Philadelphia, Pa., suffered a loss of $1,500, when one of their buildings used for storing paints and varnish was destroyed on December 23. This concern operates a brass machine shop, tool-room, and stamping, soldering, plating, polishing, japanning and lacquering departments.

The **Standard Foundry Products Company,** 661 East Lafayette St., Detroit, Mich., has been incorporated with a capital of $15,000, to manufacture brass, bronze and aluminum castings, rough or finished. They operate a brass, bronze and aluminum foundry, brass machine shop, tool-room, grinding room, casting shop, and plating, polishing and lacquering departments.

The **Waltham Watch Company,** Waltham, Mass., has secured a large order for speedometers, covering 1922 requirements, from the Packard automobile interests, for the New Little Six car. The watch company has covered its die casting requirements for this order. They operate a brass machine shop, tool-room, cutting up shop, and stamping, plating, polishing, japanning and lacquering departments.

The **Starcast Aluminum Company,** Milwaukee, has been incorporated with a capital stock of $10,000 to manufacture aluminum parts and specialties. The incorporators are Nicholas A. Boehm, of the Wisconsin Brass Foundry Co., 1664-1674 Fratney street, Helen C. Boehm, and Herman Beckman, superintendent of the brass company. The company operates an aluminum foundry and polishing department.

The **Armstrong Cork and Insulation Company,** Pittsburgh, Pa., has opened a new office in Milwaukee, Wis., at 1011 Majestic Building for the better service of its customers throughout eastern Wisconsin and the upper peninsula of Michigan. Mr. Hugh Krampe is in charge. Also the Denver office of this company has been re-instated under the charge of Mr. Alexander Callow, at 1875 Gaylord street, Pittsburgh, Pa.

The **Quigley Furnace Specialties Company,** 26 Cortlandt street, New York City, announces that it will be represented in the Chicago territory by H. M. Thompson, who succeeds Bell and Gossett, former agents. He will make his headquarters at 105 West Monroe street, Chicago. It is also announced that the Federal Supply Company, East 79th street, Cleveland, Ohio, have been appointed representatives in that territory.

The **Standard Underground Cable,** Pittsburgh, Pa., has announced the following changes in their sales organization: Mr. Atlee B. Saurman has been appointed general sales manager with headquarters in Pittsburgh, Pa. Mr. Edward Kerschner has been appointed head of the new Southeastern sales department with headquarters in Washington, D. C. Mr. F. O. Hoyt has been chosen to take charge of the Philadelphia sales department.

The **Franklin Automobile Company,** Syracuse, N. Y., will equip a portion of its plant for the manufacture of a four-cylinder air-cooled-motor automobile, weighing about 1,000 lb., and selling at about $1,000. It is planned to have an output of 100 cars per day. Departments operated are tool room, grinding room, stamping, plating, polishing, japanning and lacquering departments.

The **Wilson Welder and Metal Company,** formerly at Bush Terminal, Brooklyn, N. Y., have moved their offices and factory to 132 King street, New York, where they have installed improved equipment to handle business in their Certified Plastic Arc Welding Metals more efficiently. They have also equipped a demonstration room in which they will demonstrate the applications of the Wilson Plastic-Arc System of welding, which was used to repair the intentionally damaged German ships, interned here.

The **Inland Metals Refining Co., Inc.,** has been dissolved and changed into a co-partnership under the same management and name. Their line includes soft and hard lead, zinc, solder, antimony, tin and babbitt, the last in all grades. They also specialize in specification alloys. They operate a smelting and refining department. The co-partners are Joe Kaplan, formerly city chemist, and G. B. Perlstein, at one time with the Great Western Smelting and Refining Company. The firm has been in existence since July, 1919.

The **Cleveland Crane and Engineering Company,** Wickliffe, Ohio, has completed the construction of a huge crane for the U. S. Government Armor Plate Plant, at Charleston, W. Va. The crane is of the double bridge drive type and is pulpit operated. The runway of the crane is 165 feet above ground and the pit is 100 feet below the floor level. It has a span of 104 feet, a capacity of 75 tons, and is driven by two 200 h. p. motors. The hoisting speed is 50 feet per minute, and the lowering speed 100 feet, fully loaded.

The **Kentucky Refractories Corporation** of Russell, Ky., will break ground very shortly for the erection of their new plant to be built at that city. Their factory will be devoted to the manufacture of High Heat Duty Brick as well as Super-Refractories, and will be of fire-proof construction, electrically driven, and use the most modern manufacturing methods. The first unit which will be ready for operation at an early date will have a daily capacity of 75,000 standard brick. The company has 300 acres of clay lands adjoining their plant. The quality of this material ranks very high.

Receivers were appointed on December 21, taking active charge on December 22, for the **Aluminum Ware Manufacturing Company,** 30 Church street, New York, makers of aluminum cooking utensils, by Justice A. N. Hand, in the Federal District Court. The receivers named by the court are David J. Fox and Francis J. Caffey, former Federal District Attorney of this district, and William H. Mandeville, of Elmira, N. Y., each to give a $25,000 bond. The appointment came as a result of a suit brought by Squires and Company, 25 Broad street, New York creditors for $6,500. The book value of the company's assets was placed at $1,071,950, and the liabilities at $460,000. The company has a large manufacturing plant in Elmira, N. Y. They operate a cutting-up shop, tool room, and spinning and stamping departments.

An investigation has been made as to the practicability of manufacturing economically at the **Norfolk Navy Yard** aluminum steam jacketed kettles required for the naval service. This navy yard has made a specialty for a number of years of sheet metal products and is well equipped with modern machinery and dies, etc., for manufacturing practically all classes of sheet metal work. The investigation regarding aluminum kettles shows that with the present cost of material and labor, they can be manufactured for the following cost based on lots of ten of each size, using the current shop indirect rates: Twenty gallons, $85; 40 gallons, $105; 60 gallons, $130; 80 gallons, $145. The present cost of these kettles, purchased from outside manufacturers is as follows: Twenty gallons, $133.26; 40 gallons, $156.76; 60 gallons, $201.19; 80 gallons, $218.92.

AMERICAN BRASS DIVIDEND

Directors of the American Brass Company declared a dividend of 1½ per cent., or $1.50 a share, payable Feb. 6, 1922, to stock of record at the close of business Jan. 31. The Brass Company stock which has been deposited with the Mechanics and Metals National Bank or with the Colonial Trust Company for sale and transfer to the Anaconda Copper Mining Company, it is said, will not be transferred out of the name of the registered holders until after Jan. 31, so that this dividend will be payable directly to the person who was the registered holder of the stock at the time of deposit. This dividend will be in addition to the $150 and three shares of Anaconda Copper Mining Company stock for each share of Brass Company stock.

The banks mentioned will continue to receive deposits of the

stock of the American Brass Company up to Jan. 31, to take advantage of the offer of the Anaconda Copper Mining Company, but no deposits will be received after that date, as there has already been deposited more than 51 per cent. of the Brass Company stock, which gives Anaconda its desired control. —New York Times, January 18, 1922.

THE AMERICAN BRASS COMPANY

ASSETS

	1920	1921
Real Estate, Machinery and Tools, Jan. 1st.	$18,512,175.17	$19,420,729.68
Expended for permanent improvements during the year	3,408,554.51	2,432,840.08
	21,920,729.68	21,853,569.76
Less Charged off for depreciation	2,500,000.00	500,000.00
	19,420,729.68	21,353,569.76
Cash	1,588,696.19	3,886,597.72
Bills Receivable	908,284.52	1,347,651.50
Accounts Receivable	6,008,009.48	3,352,816.73
Wood Lands	224,530.14	183,585.74
Stocks and Bonds owned in other Companies	1,243,366.53	1,246,839 05
Government Bonds owned	3,386,828.16	3,538,251.16
Patents	1,000.00	1,000.00
Merchandise, Raw, Wrought and in Process	16,282,668.06	12,070,959.33
	$49,064,112.76	$46,981,270 99

LIABILITIES

	1920	1921
Capital Stock	$15,000,000.00	$15,000,000.00
Accounts Payable	632,811.64	1,631,825.18
Reserve for Contingencies, Taxes, etc.	9,374,524.30	9,374,524.30
Surplus	20,702,212.69	22,556,776.82
	45,709,548.63	48,563,126 30
Loss	3,354,564.13	1,581,855.31
	49,064,112.76	46,981,270.99
Surplus—January 1st	22,502,212.69	24,056,776.82
Less Dividends Paid	1,800,000.00	1,500,000.00
	20,702,212.69	22,556,776.82
Loss	3,354,564.13	1,581,855.31
	$24,056,776.82	$20,974,921.51

NO FEAR OF ARTIFICIAL GOLD

Modern chemistry has shown that at least some of the supposed elemental substances of the chemist, what he calls **elements,** are in fact compounds. In all ordinary chemical processes these compounds behave like elements, but it is nevertheless possible by special chemical operations to show that they are divisible into more simple substances. This discovery has revived to some extent popular belief in alchemy, and there have been of late many suggestions in the press that gold may be made artificially and become so abundant as to destroy completely such utility as it may have as a measure of value and a basis for currency.

It has even been stated that the late S. F. Emmons, of the United States Geological Survey, Department of the Interior, claimed to have made synthetic gold from silver dollars many years ago. Mr. Emmons never made any such claim, and the statement is absurd. No one has yet succeeded in making gold or in obtaining it from any other chemical element. The feat can not be safely called impossible, but it is fairly certain that if any chemist should succeed in transforming into gold some substance that has hitherto been regarded as a simple element, the process would be so difficult and costly as to make the gold far more expensive than the natural metal. The silver-dollar story is probably based on the fact that the silver and copper of which our so-called silver coins are made do contain exceedingly minute quantities of gold—quantities too small to be of any practical importance.—U. S. Geological Survey.

BUREAU OF MINES INVESTIGATIONS

In the course of the study of heat treatment of non-ferrous alloys, in progress at the Pittsburgh Experiment Station of the Bureau of Mines, annealing experiments are being carried out on leaded brass tubing for the purpose of examining the effect of temperature on the hardness. Tensile tests have been made of heat-treated non-ferrous alloys, and metallographic examinations made.

In the course of the aluminum investigations at the Pittsburgh Station, additional measurements have been made of the linear contraction and contraction in volume of light aluminum alloys. In the study of the disintegration of aluminum-manganese alloys, samples of 25:75 Mn-Al alloy are being exposed to the air for the purpose of observing the progress of their disintegration. A new volumetric measuring apparatus for the direct determination of metallic aluminum has been calibrated and a number of samples have been run thereon. Additional samples of cracked aluminum-alloy castings, submitted by manufacturers, have been examined.

GOVERNMENT PUBLICATIONS

Investigations of Zirconium with Especial Reference to the Metal and Oxide.—By J. W. Marden and M. N. Rich, Bureau of Mines, Washington, D. C.

Quicksilver in 1921: and, **Production of Bauxite in 1921.**—U. S. Geological Survey, Washington, D. C.

Magnesite in Pennsylvania.—New Map of New Jersey.—U. S. Geological Survey, Washington, D. C.

TRADE PUBLICATIONS

Smooth-On Instruction Book.—A catalog and book of instructions for the use of Smooth-on Iron Cements, issued by the Smooth-on Manufacturing Company, 570-574 Communipaw avenue, Jersey City, N. J.

Overhead Trucking.—A folder issued by the Cleveland Crane and Engineering Company, Wickliffe, Ohio, illustrating their overhead tramrail systems of plant and workshop transportation.

The Lighting of Metal Working Plants.—A booklet, Bulletin L. D. 134, issued by the Edison Lamp Works of the General Electric Company, Harrison, N. J., describing and illustrating the various styles of their electric lamps and systems of arrangement for use in the different departments of a metal plant.

The Sundh Cable Draw-bench.—A folder issued by the Sundh Engineering and Machine Company, 1105 Frankford avenue, Philadelphia, Pa., describing and illustrating their cable draw-bench for the production of rods, tubes, moldings and bars of various shapes.

Hytempite in the Power Plant; and, **Patching Boiler Settings.**—Two booklets issued by the Quigley Furnace Specialties Company, 26 Cortlandt street, New York, illustrating the uses of Hytempite Refractory Cement in boiler settings, etc.

Recording Electrical Instruments Catalog No. 1501.—A catalog issued by the Bristol Company, Waterbury, Conn., illustrating and describing their Recording Electric Meters.

Northern Hoists.—A pamphlet issued by the Northern Engineering Works, 210 Chene street, Detroit, Mich., illustrating and describing their electric hoists running on overhead tracks for use in foundries, etc.

Research Narrative No. 25; Measurement of Illumination.—A folder issued by the Engineering Foundation, 29 West 39th street, New York City.

Quigley Fuel Systems.—A catalog, bulletin No. 12, issued by the Hardinge Company, 120 Broadway, New York, very nicely printed, describing and illustrating the preparation, transportation and burning of pulverized fuel.

Priscilla Ware.—A catalogue issued by the Leyse Aluminum Company, Kewaunee, Wis., illustrating and describing their line aluminum kitchen utensils.

Calendar.—A unique and very appropriate calendar has been issued by the American Brass Company, Waterbury, Conn., in the shape of a piece of brass sheet, bearing their name and trade mark surrounded by a scroll border, chased and enameled in black, to which a three-month calendar pad is attached.

The Architectural League of New York, 215 West 57th street, New York, held a large exhibition for one month during 1921 in the south wing of the Metropolitan Museum of Art. This exhibition has brought the League to realize that the co-ordination of the arts, trades and sciences which contribute to the completion of an edifice would benefit materially by more direct attention. For this reason an aggressive policy has been adopted to bring the various metal concerns in contact with the architects, and the architects in contact with the metal concerns, so that they shall mutually understand what each can produce and the advantages that the designer will get from having this knowledge. The results of this getting together should prove a great benefit not only to the metal trade, etc., and to the architects, but to the general public as well; and it is with this idea that periodical exhibitions will be held in the League's rooms at 215 West 57th street, where metal products will be displayed, and which will be open not only to the members of the architectural profession, but also to the public at large. The dates of these various exhibitions will be announced later.

Outspinning the Spider.—A book by John Kimberly Mumford, published by R. L. Stillson Company, Eighth avenue, New York, being the story of wire rope making. The book is written in a popular vein, understandable to the layman, and in no meaning of the term is it technical. For the most part it relates the growth of wire making as reflected in the growth of the John A. Roebling Sons Company.

Metal Moldings.—A loose-leaf catalogue issued by Charles F. Biele and Sons Company, 379-381 West 12th street, New York, illustrating a large variety of moldings for show windows, show cases, sign frames, etc., in brass, bronze, nickel silver, copper, and aluminum.

Hendricks' Commercial Register of the United States.—The 30th edition of this well-known trade directory, for the year 1922. It has 2,324 pages, and appears in a new size 8½ x 11½ inches. A new type size and a larger page, giving more space between columns, as well as the expansion of lists and other changes go to make up an improved work. It is published by the S. E. Hendricks Company, Inc., 70 Fifth avenue, New York. The price is $12.50.

Calite Castings.—A folder issued by the Calorizing Company of Pittsburgh, Oliver Building, Pittsburgh, Pa., describing and illustrating a new alloy for use in high temperature work, which is made under patents of the General Electric Company. It can be cast into boxes, retorts, pots and other containers for molten metals, and for liquids and compounds.

METAL STOCK MARKET QUOTATIONS

	Par	Bid	Asked
Aluminum Company of America	$100	$375	$425
American Brass	100	288	292
American Hardware Corp	100	155	159
Bristol Brass	25	15	18
International Nickel, com	25	12	12¼
International Nickel, pfd.	100	69	72
International Silver, com	100	20	40
International Silver, pfd	100	94	97
New Jersey Zinc	100	132	135
Rome Brass & Copper	100	125	..
Scoville Mfg. Co	100	370	390
Yale & Towne Mfg. Co	..	275	295

Corrected by J. K. Rice, Jr., & Co., 36 Wall Street, New York.

Metal Market Review

WRITTEN FOR THE METAL INDUSTRY BY W. T. PARTRIDGE.

COPPER

The January copper market was dull. Sales on both domestic and foreign account were light. Deliveries into domestic consumption, however, were very satisfactory. One or two smaller producers as well as larger producers report that more home consumers requested their February shipments to be deliveed in January than for January shipments to be deferred and delivered in February. This indicated larger copper consumption in manufacturers' current operations than had been in December. While large producers who were heavily sold over first quarter were not disposed to reduce nominal asking prices, the fact remains that consumers in the market had no difficulty in buying electrolytic for first, second and even third quarter at 13.62½ to 13.75c. delivered toward the end of January. Prompt and early shipments of electrolytic were available at 13.50c. to 13.62½c. at the close, as compared with 13.75c. at the beginning of the year, while prime Lake delivered, January 1, was 13.87½c. and at the end of the month was 13.50c. to 13.62½c. a pound. Casting copper at the beginning of the month was 13c. f. o. b. refinery and at the end of the month 12.75c. to 12.87½c. was asked. Thus, the net result was a general weakening, with a decline of ⅛c. to ¼c. a pound on the several varieties of copper. The pressure to sell both Lake and electrolytic made by second hands toward the close was pronounced. With such copper out of the way, and continued demand, some recovery in prices is probable.

ZINC

The January zinc market opened with a quiet, steady tone at unchanged December closing levels, prompt and early 4.85c. East St. Louis, 5.20c. New York, for primary spelter, and 4.95c. for brass special. Almost immediately, the prospect of foreign buying brought about freer offerings and prices were shaded in the hope of effecting sales. The result was not satisfactory either for foreign transactions or for domestic business. The shading continued a few points at a time, but was halted January 11, for about a week, during which time offerings were available at 4.75-4.85c. East St. Louis, 5.10-5.15c. New York for prompt primary, 4.85c. brass special. By January 17, the small movement in the market was perceptibly weaker, galvanizers reporting little new business calling for zinc, and the shading of prices to attract buyers was resumed, continuing almost daily until the close when prompt and early primary was 4.50-4.55c. East St. Louis, 4.85-4.90c. New York, brass special 4.60-4.65c. The possibility of foreign buying, at the close, was again attracting attention of the trade, one small tonnage booked for Japan having been done. This feature, if developed into large buying would undoubtedly cause a rally in prices and encourage the trade. The decline in prices, however, was at least beneficial, in counteracting any desire to resume smelter operations on a larger scale—stocks on hand being amply sufficient to provide for all requirements for some time to come.

TIN

Fluctuations in the January spot tin market were between the highest levels, Straits 33.25c., 99 per cent. metal 32.50c. established January 13 and the lowest levels Straits 30.87½c., 99 per cent. tin 30c. January 25. The net result from the opening Straits 32.87½c., 99 per cent. metal 31.50c. and the closing Straits 32.00c., 99 per cent. tin 31.25c. was a decline of ⅞c. on spot. Heavy selling in the Far East, due to the customary New Year settlements in Chinese markets was responsible for the decline abroad, which in combination with the larger offerings and plentiful supplies in the domestic market accounted for the easier tone here. Demand for tin during the month was not large.

LEAD

The lead market, while less active in January, continued more fortuniate than other non-ferrous metals in respect to steady demand and steadier prices. The opening was at December closing

levels with 4.70c. East St. Louis, and New York, the basis of the leading interest throughout the entire month. In the outside market, fluctuations were narrow. After the opening at December closing, 4.40-4.45c. East St. Louis, 4.70-4.75c. New York, there was no change until January 11, when the East St. Louis figure was shaded 2½ points on prompt and early. Moderate demand continued throughout the month, the East St. Louis position being again shaded 2½ points on January 27. By the end of the month, however, the East St. Louis position had recovered to 4.37½-4.42½c. upon improved demand from paint interests, storage battery concerns, cable and lead pipe interests. At the close, business was reported as being fully up to 75 per cent. of normal. The statistical position is such as to create and maintain confidence throughout the trade.

ALUMINUM

Some improvement in demand was noted during January but there was no change in prices of the leading interest or in the outside market from the December closing levels which had carried back to pre-war levels. The schedule of the Aluminum Co. of America in 15-ton lots instead of in 50-ton lots f. o. b. shipping point being 19.10c. for 98-99 per cent. virgin, ingots, and for No. 12 alloy, and 35.10c. for sheet 18ga and heavier flat.

Outside prices were 17-18c. for 98-99 per cent. virgin, 16-17c. for 98-99 per cent. remelted and 14-15c. for No. 12 remelted. By the end of the month, outside offerings were being absorbed more rapidly, and this, combined with increased demand from cable manufacturers and the fewer offerings from abroad (because of improved demand in European markets), also, the improvement in Exchange, the outlook was distinctly better. The possibility of an increase in the U. S. tariff, also, tended to strengthen the attitude of sellers.

ANTIMONY

The antimony market in January was very dull, practically lifeless. Prices declined ten points to a new minimum, 4.40c., duty paid for carloads New York.

QUICKSILVER

Quicksilver at the beginning of the year was selling $50 per flask of 75 lbs. each. After advancing to $52 January 10, because of diminishing supplies, there was a decline, gradually, over the remainder of the month, with fresh arrivals at intervals. The closing was $47 bid and $48 asked. Importers, expecting a rise in prices because of the increase in impending tariff bill, have increased their stocks. Among important buyers during the month were Japanese, Korean and large chemical interests as well as gas manufacturers in the Middle West.

SILVER

Fluctuations in the price of silver bars of foreign origin during January were within narrow limits, the range being 2⅛c. an ounce between 64¼c., the lowest and opening level, and the highest 66⅜c. January 10. The closing was 66⅛c. making a net advance of 1⅞c. Domestic bars pegged at 99⅝c. an ounce by the Pittman act were purchased by the Government for the Philadelphia and San Francisco mints, carrying the total to 90,244,888 ounces on January 25. Importations during the twelve months of 1921, according to U. S. Commerce statistics were $63,242,671. Exports during same period were 51,575,399, making the excess of imports over exports for the year, $11,667,272. In 1920, exports of silver were in excess of imports to the amount of $25,556,183.

PLATINUM

Platinum prices during January advanced gradually from $84 per ounce for pure, at the beginning of the month to $105 per ounce on January 17, the rise being largely due to reduced supplies of spot metal. By the end of the month, demand having subsided somewhat, bids were $100 with sellers still asking $105. Transactions during the month were well distributed among chemical, electrical and jewelry interests. American production during 1921 was increased 14,100 ounces as compared with 6,967 ounces in 1920.

OLD METALS

The movement in old metals was contrary to expectations and very disappointing to the trade. Coppers which continued in the lead declined 1c. to 10c. for uncrucibled, ¾c. to 8.25c. for light copper, and ½c. to 11c. for strictly crucibled. No. 1 brass turnings after advancing to 5.50c. were off at the end of the month to 4.75c. and heavy brass after rising in first week to 5.37½c. was off to 5c. a pound. Throughout the entire list, with the exceptions of special heavy brass which maintained its ½c. rise to 6.50c. and aluminum clippings which also kept its 12c. advance to 11.75c. there were declines of from ⅛c. to 1c. a pound. The trend at the close was downward, the volume of business still being light.

JANUARY MOVEMENT IN METALS

	Highest	Lowest	Average
Copper:			
Lake	13.87½	13.50	13.762
Electrolytic	13.75	13.37½	13.601
Casting	13.00	12.75	12.964
Tin	33.25	30.87½	32.107
Lead	4.45	4.35	4.405
Zinc (brass special)	4.95	4.60	4.811
Antimony	4.50	4.40	4.452
Aluminum	18.50	17.00	17.738
Quicksilver (per flask)	52.00	47.00	50.143
Silver (cts. per oz.) foreign	66⅜	64⅛	65.455

WATERBURY AVERAGE

Lake Copper—Average for 1920, 13.136.—January, 1922—13.875.

Brass Mill Zinc—Average for 1920, 5.175.—January, 1922—5.25.

Metal Prices, February 6, 1922

NEW METALS

Open Market

COPPER—DUTY FREE. PLATE, BAR, INGOT AND OLD COPPER. Manufactured 6 per centum.

	Cents
Electrolytic, carload lots, delivered	13½-13¾c.
Lake, carload lots, delivered	13½-13¾c.
Casting, carload lots, delivered	12⅞-13c.

TIN—Duty free.

Straits, carload lots	31½-32c.

LEAD—Duty, Pig, Bars and Old, 25%; pipe and sheets, 20%. Pig, carload lots	4.70-4.75

ZINC—Duty 15%.

Brass Special	4.95-5.00
Prime, Western, carload lots	4.85-4.90

ALUMINUM—Duty, Crude, 2c. per lb. Bales, sheets, bars and rods, 3½c. per lb.

Small lots, f. o. b. factory	....
100-lb. f. o. b. factory	....
Ton lots, f. o. b. factory	17-20.10

ANTIMONY—Duty 10%.

Cookson's Hallet's or American	Nominal
Chinese, Japanese, Wah Chang WCC, brand spot	4.40

NICKEL—Duty, Ingot, 10% ad valorem. Sheet, strip, strip and wire, 20%.

Ingot	41.00
Shot	41.00
Electrolytic	31½-44

MANGANESE METAL—95-98% Mn., carbon free, per lb. Mn. contained. Nominal	0.75
MAGNESIUM METAL—Duty 20% ad valorem (100 lb. lots)	$1.25-1.35
BISMUTH—Duty free	2.10-2.25
CADMIUM—Duty free	1.00-1.25
CHROMIUM METAL—95-98% Cr., per lb. Cr. contained. Nominal	1.50
COBALT—97% pure	3.00-3.25
QUICKSILVER—Duty 10% per flask of 75 lbs	47-48
PLATINUM—Duty free, per ounce	100-105
SILVER—Government assay—Duty free, per ounce	.99⅝
GOLD—Duty free, per ounce	20.67

Metal Prices, February 6, 1922

INGOT METALS

Silicon Copper, 10%	according to quantity	34 to38
Phosphor Copper, guaranteed 15%	" " "	19 to29
Phosphor Copper, guaranteed 10%	" " "	18½to28½
Manganese Copper, 30%	" " "	50 to56
Phosphor Tin, guarantee 5%	" " "	35⅝to45⅝
Phosphor Tin, no guarantee	" " "	41¾to51
Brass Ingot, Yellow	" " "	8¼to11
Brass Ingots, Red	" " "	12¾to14
Bronze Ingot	" " "	11½to13¾
Parsons Manganese Bronze Ingots	" " "	16½to18
Manganese Bronze Castings	" " "	24 to33
Manganese Bronze Ingots	" " "	13 to16
Manganese Bronze Forgings	" " "	30 to40
Phosphor Bronze	" " "	24 to30
Casting Aluminum Alloys	" " "	18 to21
Monel Metal	" " "	38

OLD METALS

Buying Prices		Selling Prices
10¼to10¾	Heavy Cut Copper	11¾to12
10 to10½	Copper Wire	11½to11¾
8½to 9	Light Copper	10 to10½
9 to 9½	Heavy Machine Comp	11 to11½
6½to 7	Heavy Brass	8 to 8½
5 to 5½	Light Brass	6½to 7
5½to 6	No. 1 Yellow Brass Turnings	6½to 7
7½to 8	No. 1 Comp. Turnings	9 to 9½
4	Heavy Lead	4½
4	Zinc Scrap	4½
5 to 5½	Scrap Aluminum, Turnings	7 to 8
10½to11½	Scrap Aluminum, cast alloyed	12½to13½
13½to14½	Scrap Aluminum, sheet (new)	15½to16½
18½	No. 1 Pewter	22½
15	Old Nickel anodes	17
23 to25	Old Nickel	27 to29

BRASS MATERIAL—MILL SHIPMENTS

In effect Dec. 1, 1921

To customers who buy 5,000 lbs. or more in one order.

	Net base per lb.		
	High Brass.	Low Brass.	Bronze.
Sheet	$0.16¾	$0.18¼	$0.19¾
Wire	0.17¼	0.18¾	0.20¼
Rod	0.14¾	0.19¼	0.20¾
Brazed tubing	0.23½	....	0.28½
Open seam tubing	0.23½	....	0.28½
Angles and cannels	0.25½	....	0.30½

To customers who buy less than 5,000 lbs. in one order.

	Net base per lb.		
	High Brass.	Low Brass.	Bronze.
Sheet	$0.17¾	$0.19¼	$0.20¾
Wire	0.18¼	0.19¾	0.21¼
Rod	0.15¾	0.20¼	0.21¾
Brazed tubing	0.24½	....	0.29½
Open seam tubing	0.24½	....	0.29½
Angles and channels	0.26½	....	0.31½

SEAMLESS TUBING

Brass, 18½c. to 19½c. per lb. base.
Copper, 21¼c. to 22¼c. per lb. base.

TOBIN BRONZE AND MUNTZ METAL

Tobin, Bronze Rod	18¾c. net base
Muntz or Yellow Metal Sheathing (14"x48")	16¾c. " "
Muntz or Yellow Rectangular Sheets other than Sheathing	17¾c. " "
Muntz or Yellow Metal Rod	14¾c. " "

Above are for 100 lbs. or more in one order.

COPPER SHEET

Mill shipments (hot rolled)	21¼c.-22¼c. net base
From stock	22¼c.-24¼c. net base

BARE COPPER WIRE—CARLOAD LOTS

15¼c. to 15½c. per lb. base.

SOLDERING COPPERS

300 lbs. and over in one order	19¼c. per lb. base
100 lbs. to 300 lbs. in one order	19¾c. per lb. base

ZINC SHEET

Duty, sheet, 15%. Cents per lb.

Carload lots, standard sizes and gauges, at mill, 8c. basis less 8 per cent. discount.

Casks, jobbers' prices	9c. to 9½c.
Open casks, jobbers' prices	10c. to 10½c.

ALUMINUM SHEET AND COIL

Aluminum sheet, 18 ga. and heavier, base price	35c.
Aluminum coils, 24 ga. and heavier, base price	30c.

NICKEL SILVER (NICKELENE)

Base Prices

Grade "A" Nickel Silver Sheet Metal

10% Quality	25c.	per lb.
15% "	27c.	" "
18% "	27¾c.	" "

Nickel Silver Wire and Rod

10% Quality	28c.	per lb.
15% "	32¼c.	" "
18% "	35c.	" "

MONEL METAL

(Prices Nominal)

Shot	35
Blocks	35
Sheet Bars	40
Hot Rolled Rods (base)	42
Cold Drawn Rods (base)	56
Hot Rolled Sheets (base)	55

BLOCK TIN SHEET AND BRITANNIA METAL

Block Tin Sheet—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more, 10c. over Pig Tin. 40 to 100 lbs., 15c. over 25 to 50 lbs., 17c. over, less than 35 lbs., 25c. over.

No. 1 Britannia—18" wide or less. No. 26 B. & S. Gauge or thicker, 500 lbs. or over, 8c. over N. Y. tin price; 100 lbs. or more, 10c. over Pig Tin. 50 to 100 lbs., 15c. over, 25 to 50 lbs., 20c. over, less than 25 lbs., 25s. over. Above prices f. o. b. mill.

Lead Foil—base price—figured on base price of lead at the time.

Platers' metal, so called, is very thin metal not made by the larger mills and for which prices are quoted on application to the manufacturer.

SILVER SHEET

Rolled silver anodes .999 fine are quoted at from 70c. to 73c. per Troy ounce, depending upon quantity.

Rolled sterling silver, 67c. to 70c.

NICKEL ANODES

85 to 87% purity	.40c.	per lb.
90 to 92% "	.42½c	per lb.
95 to 97% "	.45c.	per lb.

Supply Prices, February 6, 1922

CHEMICALS

In Commercial Quantities—New York Prices

Acid—		
Boric (Boracic) Crystals	lb.	.14
Hydrochloric (Muriatic) Tech., 20 deg., Carboys	lb.	.02½
Hydrochloric, C. P., 20 deg., Carboys	lb.	.08
Hydrofluoric, 30%, bbls	lb.	.07
Nitric, 36 deg. Carboys	lb.	.07
Nitric, 42 deg. Carboys	lb.	.07¼
Sulphuric, 66 deg., Carboys	lb.	.02½
Alcohol—		
Denatured in bbls	gal.	.40-.50
Alum—		
Lump, Barrels	lb.	.04
Powdered, Barrels	lb.	.05
Aluminum sulphate, commercial tech	lb.	.02½-.03
Aluminum chloride solution	lb.	.20
Ammonium—		
Sulphate, tech., Barrels	lb.	.04
Sulphocyanide	lb.	.50
Argols, white, see Cream of Tartar	lb.	.28
Arsenic, white, Kegs	lb.	.06¼
Asphaltum	lb.	.35
Benzol, pure	gal.	.45
Blue Vitrol, see Copper Sulphate.		
Borax Crystals (Sodium Biborate), Barrels	lb.	.05½
Calcium Carbonate (Precipitated Chalk)	lb.	.05
Carbon Bisulphide, Drums	lb.	.07½
Chrome Green	lb.	37-42
Cobalt Chloride	lb.	—
Copper—		
Acetate	lb.	.48
Carbonate, Barrels	lb.	.19
Cyanide	lb.	.58
Sulphate, Barrels	lb.	.05¾
Copperas (Iron Sulphate, bbl.)	lb.	.02½
Corrosive Sublimate, see Mercury Bichloride.		
Cream of Tartar, Crystals (Potassium bitartrate)	lb.	.28
Crocus	lb.	.15
Dextrin	lb.	.05-.08
Emery Flour	lb.	.06
Flint, powdered	ton.	$30.00
Fluor-spar (Calcic fluoride)	ton	$75.00
Fusel Oil	gal.	3.00
Gold Chloride	oz.	14.00
Gum—		
Sandarac	lb.	.30
Shellac	lb.	—
Iron, Sulphate, see Copperas, bbl	lb.	.02½
Lead Acetate (Sugar of Lead)	lb.	.12-.13
Yellow Oxide (Litharge)	lb.	.09
Mercury Bichloride (Corrosive Sublimate)	lb.	.68
Nickel—		
Carbonate Dry	lb.	.50-.55
Chloride, 100 lb. lots	lb.	.30-.40
Salts, single, bbls	lb.	.11
Salts, double, bbl.	lb.	.11
Paraffin	lb.	.07-.10
Phosphorus—Duty free, according to quantity		.25-.30
Potash, Caustic, Electrolytic 88-92% fused, drums	lb.	6½
Electrolytic, 70-75% fused	lb.	.10
Potassium Bichromate, casks	lb.	.11
Carbonate, 80-85%, casks	lb.	.07
Cyanide, 165 lb. cases, 94-96%	lb.	.42½
Pumice, ground, bbls	lb.	.04
Quartz, powdered	ton.	$30.00
Official	oz.	—
Rosin, bbls.	lb.	.03½
Rouge, nickel, 100 lb. lots	lb.	.20
Silver and Gold	lb.	.60
Sal Ammoniac (Ammonium Chloride) in casks	lb.	.07½
Silver Chloride, dry	oz.	.86
Cyanide	oz.	—
Nitrate, 100 ounce lots	oz.	.45
Soda Ash, 58%, bbls	lb.	.03
Sodium—		
Biborate, see Borax (Powdered), bbls	lb.	.05½
Bisulphate, tech., bbls	lb.	.03½
Cyanide, 96 to 98%, 100 lbs	lb.	.26
Hydrate (Caustic Soda) bbls	lb.	.04½
Hyposulphite, kegs	lb.	.04
Nitrate, tech. bbls	lb.	.04
Phosphate, tech., bbls	lb.	.06
Silicate (Water Glass) bbls	lb.	2½
Sulpho Cyanide	lb.	.60
Soot, Calcined	lb.	—
Sugar of Lead, see Lead Acetate	lb.	.12-.13
Sulphur (Brimstone) bbls	lb.	.03
Tin Chloride	lb.	.33
Tripoli	lb.	.03½
Verdigris, see Copper Acetate	lb.	.48
Water Glass, see Sodium Silicate, bbls	lb.	.02½
Wax—		
Bees, white ref. bleached	lb.	.55
Yellow, No. 1	lb.	.21
Whiting, Bolted	lb.	.02½-.06
Zinc, Carbonate, bbls	lb.	.14-.18
Chloride, 600 lb. lots	lb.	.07½
Cyanide	lb.	.42
Sulphate, bbls.	lb.	.03½

COTTON BUFFS

Open buffs, per 100 sections (nominal).

12 inch,	20 ply,	64/68,	cloth	base,	$33.80
14 "	20 "	64/68,	"	"	42.05
12 "	20 "	84/92,	"	"	42.55
14 "	20 "	84/92,	"	"	57.35

Sewed Buffs, per pound

Bleached and unbleached .... " .50

FELT WHEELS

		Price Per Lb. Less Than 100 Lbs.	100 to 300 Lbs.	300 Lbs. and Over
Diameter—10" to 16"	1" to 3"	2.50	2.40	2.25
" 6", 8" and over 16"	1" to 3"	2.60	2.50	2.35
" 6" to 24"	Over 3"	2.90	2.80	2.65
" 6" to 24"	½" to 1"	3.50	3.40	3.25
" 4" to 6"	¼" to 3"	4.50	Any quantity	
" Under 4"	¼" to 3"	5.10	Any quantity	

Grey Mexican or French Grey—10c. less per lb. than Spanish, above. Odd sizes 50c advance.